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Liebert® DM Series Air Conditioner

User Manual

EMERSON
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New Liebert_DM Series Air Conditioner

User Manual

Version	V1.0
Revision date	April 28, 2013
BOM	31012860

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Chapter 1 Overview

This chapter introduces the model description, product introduction, basic performance parameters, main components, options and ambient requirement, and refrigerant charging requirement of the new Liebert_DM series air conditioner (Liebert_DM AC for short).

1.1 Model Description

The model description of the Liebert_DM AC is shown in Figure 1-1.

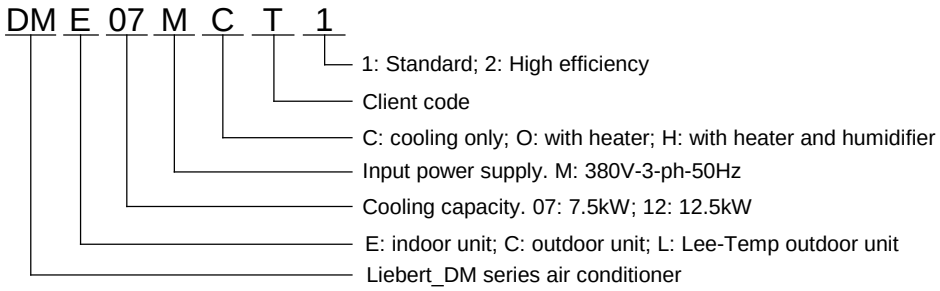

DM E 07 M C T 1
1: Standard; 2: High efficiency
Client code
C: cooling only; O: with heater; H: with heater and humidifier
Input power supply. M: 380V-3-ph-50Hz
Cooling capacity. 07: 7.5kW; 12: 12.5kW
E: indoor unit; C: outdoor unit; L: Lee-Temp outdoor unit
Liebert_DM series air conditioner

Figure 1-1 Model description

1.2 Product Introduction

The Liebert_DM AC is a small precise environment control system, specially designed for cooling the electrical devices. It is applicable to environment control in equipment room and computer room. Featuring high reliability, it can maintain a favorable running environment for precise devices such as sensitive devices, industry process devices, communication devices and computers.

The cooling kit is provided as standard and it can precisely control the ambient temperature. The heater and humidifier are provided as options and they can precisely control the ambient humidity. If the AC unit is only used for cooling, the options are not needed.

The Liebert_DM AC provides a micro-processing controller that can automatically switch over to the required function (cooling or heating, dehumidifying or humidifying), based on the programmed setpoints and room ambient conditions.

Each Liebert_DM AC consists of an indoor unit and an outdoor unit. Both units are installed on the floor separately.

Indoor unit

The Liebert_DM AC includes units with a cooling capacity of 7.5kW and 12.5kW, which are applicable to power supply of 380V, 3-ph. You can select them according to the actual equipment room conditions.

Outdoor unit

The outdoor unit adopts air cooled mode. It is classified into two models: standard model and Lee-Temp model. The Lee-Temp model can be used at lower temperature (see Table 1-1) than the standard model.

1.3 Basic Performance Parameters

The basic performance parameters of the Liebert_DM AC are given in Table 1-1.

Table 1-1 Basic performance parameters

Model	Nominal refrigeration capacity (kW)	Power（kW）	Energy efficiency rate	Heating capacity[1] (kW)	Humidification capacity[2] (kg/h)
DME07M**1	7.5	2.5	3.0	3.2	2.5
DME12M**1	12.5	4.15	3.0	3.2	2.5
DME07M**2	7.5	2.34	3.2	3.2	2.5
DME12M**2	12.5	3.9	3.2	3.2	2.5

Model	Nominal refrigeration capacity (kW)	Power（kW）	Energy efficiency rate	Heating capacity[1] (kW)	Humidification capacity[2] (kg/h)
Note: [1]: The heating capacity is only for the models with heating function; [2]: The humidification capacity is only for the models with humidification function					

1.4 Main Components

1.4.1 Indoor Unit

The indoor unit consists of evaporator, compressor, fan, micro-processing controller, thermal expansion valve, strainer, filter, heater (optional), humidifier (optional) and surge protective devices (SPD, optional). For option introduction, refer to *1.5 Options*.

Evaporator

Adopt a fin-tube heat exchanger with high efficiency. The distributor is designed and verified according to individual model to ensure that the refrigerant is distributed evenly in each loop, improving the efficiency of the heat exchanger to a great extent.

Compressor

Adopt a compressor with high efficiency ratio. It features low vibration, low noise and high reliability.

Fan

Adopt a centrifugal fan with high efficiency and high reliability. It features large airflow, long blowing distance, direct driving and easy maintenance.

Micro-processing controller

Provide a simple-operation user interface with multi-level password protection, self-recovery upon power failure, high-voltage & low-voltage protection, phase loss protection, automatic phase-sequence switching upon anti-phase and rotate speed control of the outdoor fan. The expert-level fault diagnose system can automatically display current fault information to facilitate equipment maintenance by maintenance personnel.

Thermal expansion valve

Adopt a thermal expansion valve with external equalizer type. It collects temperature and pressure signals at the same time to accurately regulate the refrigerant flow.

Strainer

Filtrate the impurities generated during long-term system operation and ensure normal system operation.

Filter

Adopt nylon filter material with big mesh for Liebert_DM AC. The filter features compact structure and easy maintenance. It can be washed repeatedly.

1.4.2 Outdoor Unit

The outdoor unit consists of fan and condenser. Other than the above components, the Lee-Temp model also includes a low-temperature unit.

Fan

Adopt axial flow blades with low noise. The single-phase motor with high performance is customized based on the power grid of base stations, so it can work over a wide voltage range with high reliability.

Condenser

Adopt a fin-tube heat exchanger with high heat dissipation and wavy fins. It is free of dust accumulation, and can be easily cleaned and maintained.

Low-temperature unit

Make the AC unit operate in cooling mode normally at the lowest outdoor temperature of -34°C.

1.5 Options

1.5.1 Humidifier

The humidifier can add pure water vapor (up to 2.5 kg/hour) into the room to control the indoor humidity within ranges required by devices and computer.

The humidifier consists of a steam canister with automatic flushing control function, inlet tube, drain tube, solenoid valve and steam distributor.

🕮 **Note**

1. The electrode humidifier should be installed and tested in factory.
2. The Liebert_DM AC can control the ambient humidity only after a humidifier is installed.

1.5.2 Heater

A ceramic heater with positive temperature coefficient can be selected. It is safe and reliable. When the surface temperature is too high, it will reduce the heating power to avoid danger caused by over-temperature. A temperature switch is provided on the surface of the heater, and it will cut off the power of the heater when the surface temperature is too high. When the surface temperature decreases to normal, the temperature switch will restore the operation of the heater automatically.

1.5.3 Remote Monitor

The Liebert_DM AC communicates with the host computer through a configured RS485 port and receives the control of the host software. You can also select and configure a monitoring card to realize different monitoring functions. For the descriptions of the host monitoring software RDU-Cooling developed by Emerson, refer to *Appendix 3 RDU-Cooling Air-Conditioner Single-Unit Manager Software Introduction.*

1.5.4 Energy-Saving Card

The Liebert_DM AC can monitor the maximum room temperature with the energy-saving card located outside the unit cabinet. The card is placed in position with high heat load and temperature. Up to four cards can be used for an AC unit. When the temperatures measured by all energy-saving cards are lower than the setpoint in ‘Sleep Mod’ and only indoor fan is running, if the ‘Sleep Mod’ is set to ‘ENAB’, the AC unit will turn off the indoor fan and enter the sleep mode for saving the energy.

1.5.5 Power SPD

The power SPD is used for second level (C level) lightning over-voltage protection of the AC power. It can be maintained easily and provides status indicating and alarm function.

🕮 **Note**

The humidifier, heater and power SPD should be installed in factory.

1.6 Ambient Requirements

1.6.1 Operation Environment

The operation environment requirements are listed in Table 1-2.

Table 1-2 Operation environment requirements

Item	Requirements
Installation position	The maximum equivalent horizontal distance between the indoor unit and outdoor unit[1]: 50m; Vertical distance △H[2]: -5m ≤ △H ≤ 20m
Installation mode	Indoor unit: vertical mode, mounting base ≥ 150mm; outdoor unit: horizontal airflow mode
Ambient temperature	Indoor: 0°C ~ 40°C Outdoor: standard model, -15°C ~ +45°C; Lee-Temp model, -34°C ~ +45°C
Ambient humidity	30%RH ~ 80%RH
Protection level	Outdoor unit: IPX4
Altitude	< 1000m. Derating is required when the altitude exceeds 1000m
Operation voltage range	380V (-15% ~ +15%), settable according to different environments, the error is 3%
Note: [1]: For the equivalent lengths of parts, refer to Table 2-4. [2]: The value is positive if the outdoor unit is installed above the indoor unit; negative if the indoor unit is installed above the outdoor unit	

1.6.2 Storage Environment

The storage environment requirements are listed in Table 1-3.

Table 1-3 Storage environment requirements

Item	Requirements
Storage environment	Indoor, clean (without dust)
Ambient humidity	5%RH ~ 85%RH
Ambient temperature	-40°C ~ +70°C
Storage time	The total shipment and storage time should not exceed six months. Otherwise, the performance needs to be re-calibrated

1.7 Refrigerant Charging Requirement

The low quality or counterfeit refrigerant will damage the system severely. Please use the refrigerant approved by Emerson Network Power Co., Ltd. For the system abnormity or damage caused by using other brands of refrigerant, the warranty will be invalid.

See Table 1-4 for the refrigerant brands approved by Emerson Network Power Co., Ltd.

Table 1-4 Approved refrigerant brands

Brand	LOGO	Note
DU PONT		The DU PONT refrigerant adopts Emerson custom-made package
JUHUA		

Chapter 2 Mechanical Installation

This chapter expounds the mechanical installation of the Liebert_DM AC, including unpacking & inspection, installation notes, system installation arrangement, installing indoor unit, installing outdoor unit, piping, removing transportation fastener and vibration absorber, adding refrigerant for long pipe system and check list.

2.1 Unpacking And Inspection

Move the product to the place most close to the final installation site and then unpack it.

If any part is found missing or damaged, please report to your carrier immediately. If any covert defect is found, please report to the carrier and the local sales office too. Do not accept a damaged unit.

2.2 Installation Notes

1. The Liebert_DM AC adopts split-floor installation. The indoor unit must be installed on the floor in the equipment room or computer room. The outdoor unit can be installed outdoors or on the floor in other rooms.

2. Before installation, make sure that the installation environment meets the requirements (see *1.6 Ambient Requirements*) and that the building should be transformed to accommodate the construction work such as piping, wiring and ventilation ducts.

3. The installers must strictly follow the design drawings for installation and reserve space for installation and maintenance. The manufacturer's engineering dimension drawings can serve as a reference.

2.3 System Installation Arrangement

2.3.1 General Arrangement

The system general arrangement diagram is shown in Figure 2-1. The standard pipe sizes are shown in Table 2-1.

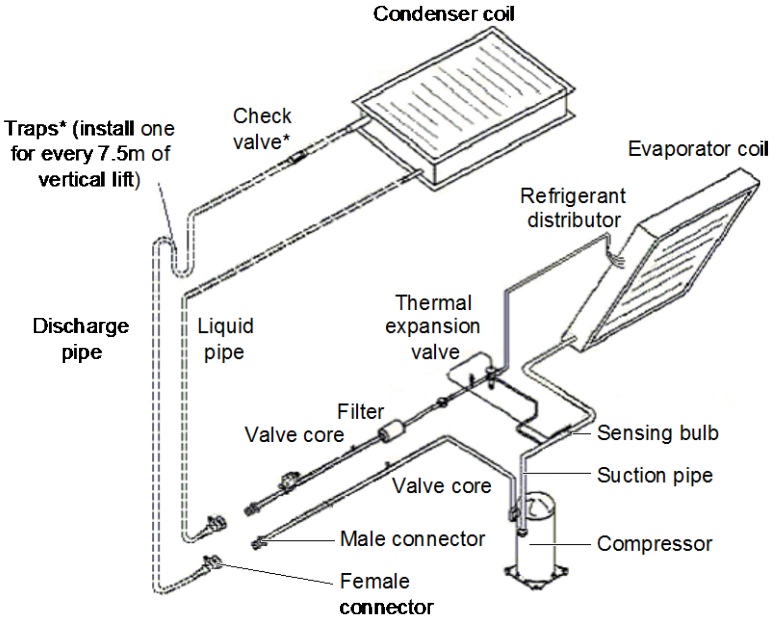


Figure 2-1 General arrangement diagram

Note

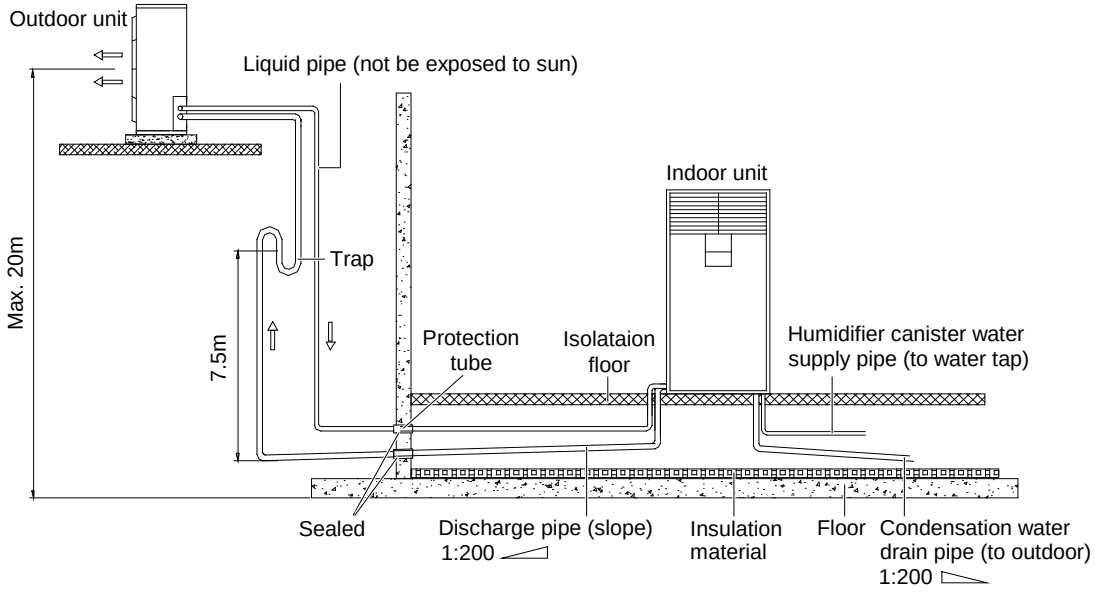
1. ═══════: Factory piping.
2. ═ ═ ═ ═ ═ ═ ═ ═ ═ ═ ═: Field piping (by technicians).
3. *: Check valve and traps are optional and not supplied by Emerson. But they are recommended for normal system operation and easy maintenance. They should be installed on site by technicians.
4. +: Solenoid valve is a part of extended piping kit.

Table 2-1 Standard pipe sizes

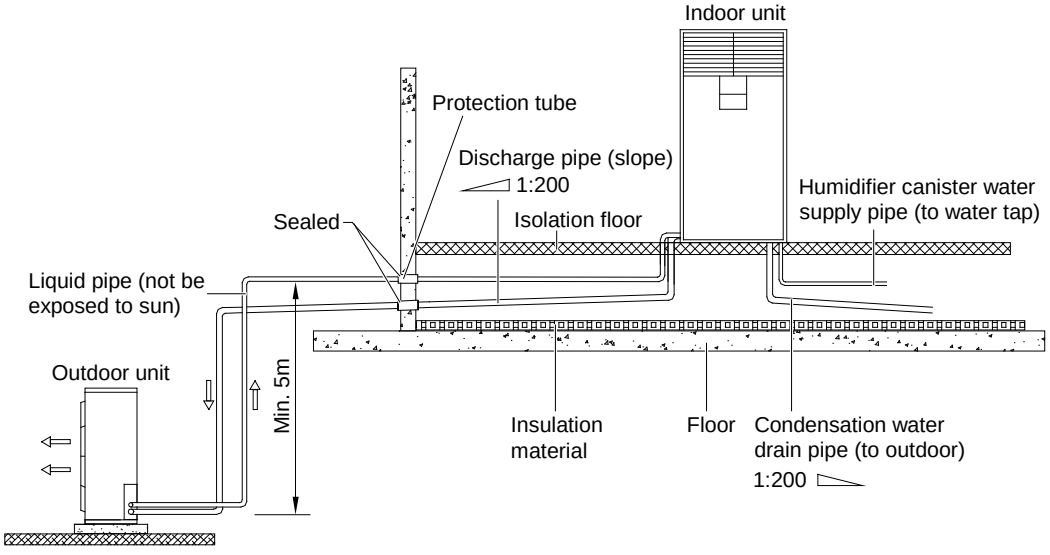
Actual cooling capacity		Pipe length (m)	Discharge pipe OD	Liquid pipe OD
Liebert_DM series	7.5kW unit	5	1/2” (12mm)	3/8” (10mm)
	12.5kW unit	5	5/8” (16mm)	1/2” (12mm)

2.3.2 System Installation Illustration

All equipment must be installed vertically. The Liebert_DM AC is available in two installation modes: outdoor unit installed higher than indoor unit and indoor unit installed higher than outdoor unit. See Figure 2-2 for details.



Outdoor unit above indoor unit



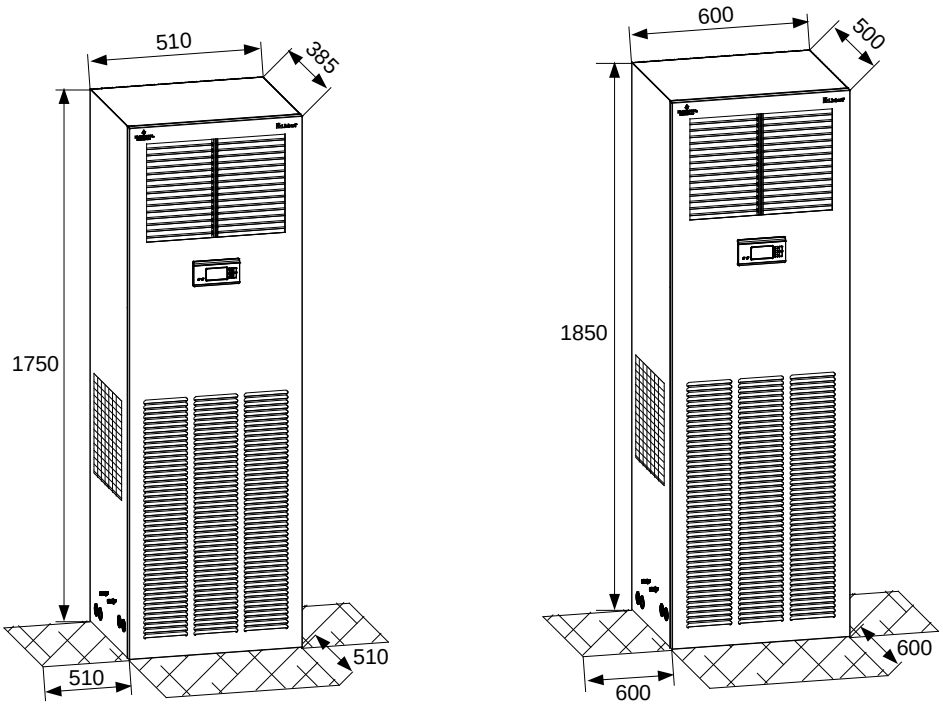
Indoor unit above outdoor unit

Figure 2-2 Installation illustration

2.3.3 Mechanical Parameters

Indoor unit

The mechanical parameters of the indoor unit are shown in Figure 2-3 and Table 2-2.



DME07kW *DME12kW*

Figure 2-3 Dimensions of indoor unit (unit: mm)

The shadows in Figure 2-3 indicate a reasonable installation and service space. The two sides of the unit need air inlet. Enough service space must be reserved for the unit to facilitate maintenance.

The AC unit equipped with a heater should be kept a distance of minimum 150mm from combustible substance. When testing the AC unit, keep the external static pressure below 150Pa lest the air volume becomes too low and the heater becomes too hot.

Outdoor unit

The mechanical parameters of the outdoor unit are shown in Figure 2-4, Figure 2-5 and Table 2-2.

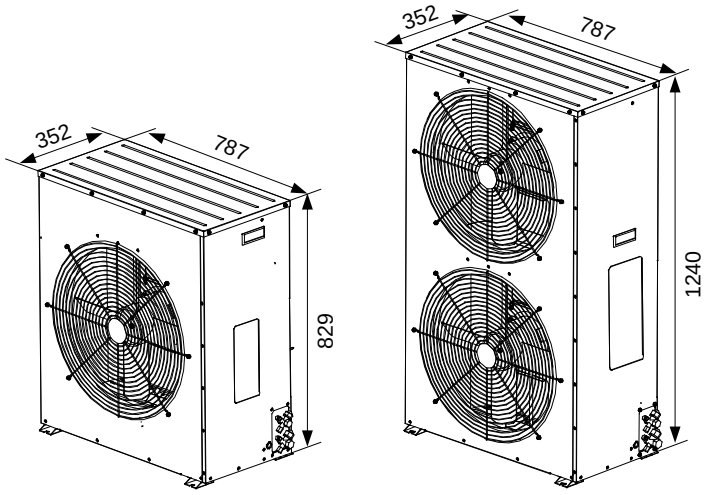


Figure 2-4 Dimensions of standard outdoor unit (unit: mm)

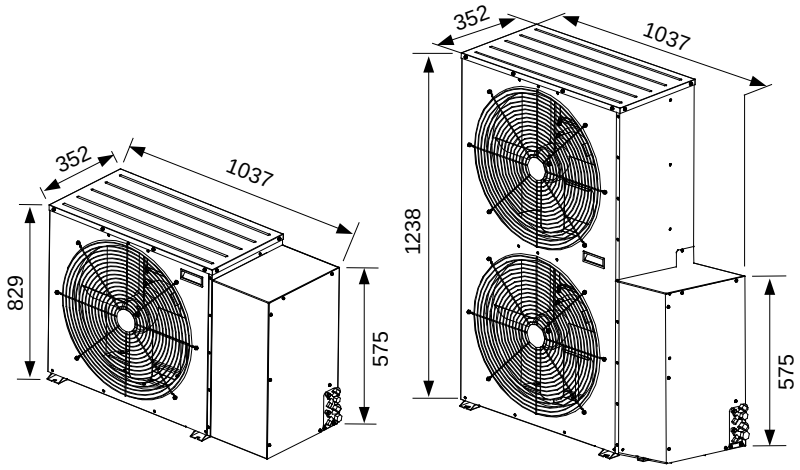


Figure 2-5 Dimensions of Lee-Temp outdoor unit (unit: mm)

Table 2-2 Mechanical parameters of indoor unit and outdoor unit

Model		Cooling capacity (kW)	Dimensions (W × D × H, mm)	Net weight (kg)
Indoor unit		7.5	510 × 385 × 1750	90
		12.5	600 × 500 × 1850	145
Outdoor unit	Standard model	7.5	787 × 352 × 829	40
		12.5	787 × 352 × 1240	60
	Lee-Temp model	7.5	1037 × 352 × 829	53
		12.5	1037 × 352 × 1238	95

2.4 Installing Indoor Unit

2.4.1 Equipment Room Requirements

The equipment room requirements are given as follows:

1. The equipment room should be well insulated and have a sealed damp-proof layer.

Note

The most important elements for maintaining normal environmental control in the conditioned room are damp proof and heat preservation.

2. The outdoor air should be kept from entering to a minimum. The outside air will add the loads of heating, cooling, humidifying and dehumidifying of the system. It is recommended that the inhalation of outside air be kept below 5% of the total indoor airflow.

3. All the doors and windows should be properly sealed to minimize the leakage and the seams should be as narrow as possible.

2.4.2 Installation Location Requirements

Note

The Liebert_DM AC can generate condensate water. Water leakage can cause damage to other precise equipment nearby. Do not install the AC units in the vicinity of any precision equipment. The installation site must provide drainpipes.

The installation location requirements are given as follows:

1. Try to locate the indoor unit in a capacious floor space to ensure its normal operation.

2. Avoid locating the indoor unit in confined areas that affect the airflow pattern, shorten cooling cycles and result in down-draft and air noise.

3. Avoid locating the indoor unit in an alcove or at the extreme end of a long, narrow room.

4. Avoid locating multiple indoor units close to each other. This can result in crossing air patterns, uneven loads and competing operation.

5. Do not install additional devices (such as smoke detectors) over the cabinet for facilitating routine maintenance.

Figure 2-6 indicates the installation location of the indoor unit.

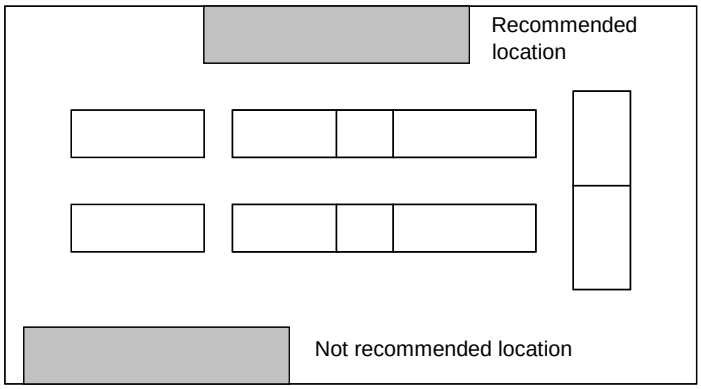
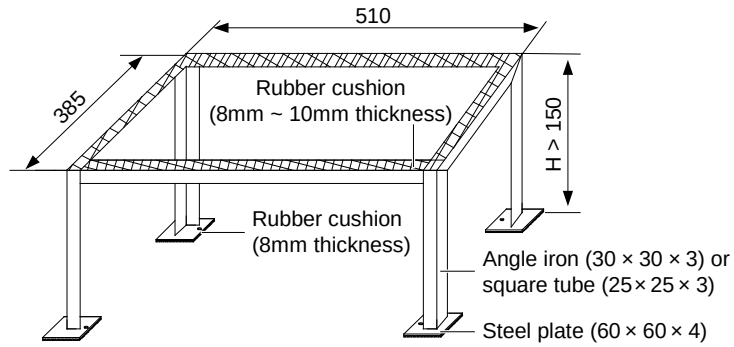


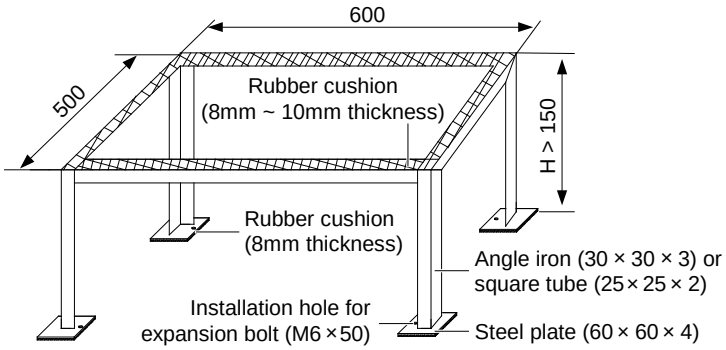
Figure 2-6 Installation location of the indoor unit

2.4.3 Installation Procedure

1. Secure the mounting base made by yourself on the selected location. The outline and dimensions of the mounting base are shown in Figure 2-7.



Mounting base of DME07kW indoor unit



Mounting base of DME12kW indoor unit

Figure 2-7 Mounting base (unit: mm)

2. Lay a rubber cushion with 8mm ~ 10mm thickness on the mounting base, as shown in Figure 2-7.

3. Place the indoor unit onto the mounting base and secure it.

4. Rotate the grilles to regulate the airflow direction of the indoor unit, and the regulating angle is 45°, as shown in Figure 2-8.

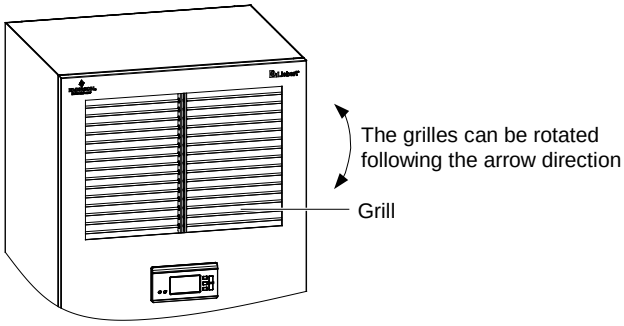


Figure 2-8 Regulating airflow direction

2.5 Installing Outdoor Unit

2.5.1 Installation Notes

1. Install the outdoor unit in a place which is secure and easy for maintenance. Do not install it on ground-level sites with public access and be away from residential areas.

2. Do not locate it directly in the environment that requires low noise.

3. To ensure heat dissipation effect, locate it in a clean area, which is away from loose dirt and foreign matter to avoid clogging the heat exchanger.

4. Do not locate it in the vicinity of steam, hot air and exhausts.

5. Keep a clearance of more than 450mm between the outdoor unit and the wall, obstruct and adjacent devices.

6. Avoid areas where snow will accumulate at air-inlet side and air-outlet side of the outdoor unit.

7. Prepare a solid base capable of supporting the outdoor unit weight (see Table 2-2). The base should be at least 50mm higher than the surrounding ground and 50mm larger than the dimensions of the outdoor unit base, as shown in Figure 2-11.

2.5.2 Installation Procedure

1. Place the outdoor unit on the base.

2. Secure the outdoor unit onto the base with expansion bolts. The installation hole sizes of the base are shown in Figure 2-9 and Figure 2-10.

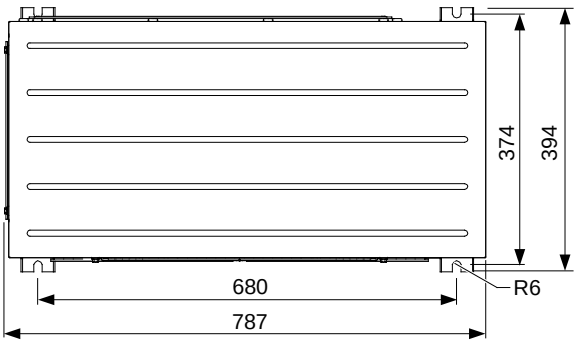


Figure 2-9 Installation hole dimensions of standard outdoor unit base (top view, unit: mm)

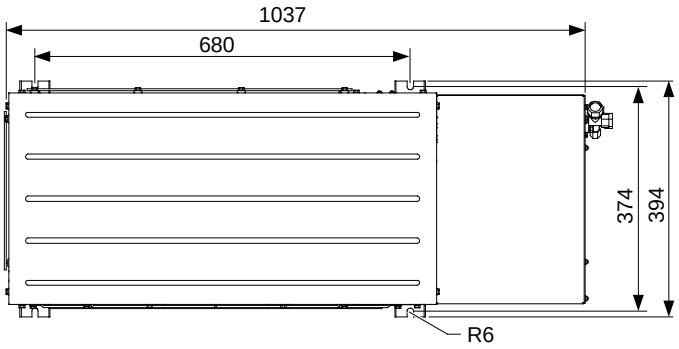


Figure 2-10 Installation hole dimensions of Lee-Temp outdoor unit base (top view, unit: mm)

If multiple outdoor units need to be installed with one above the other, see Figure 2-11 to install them.

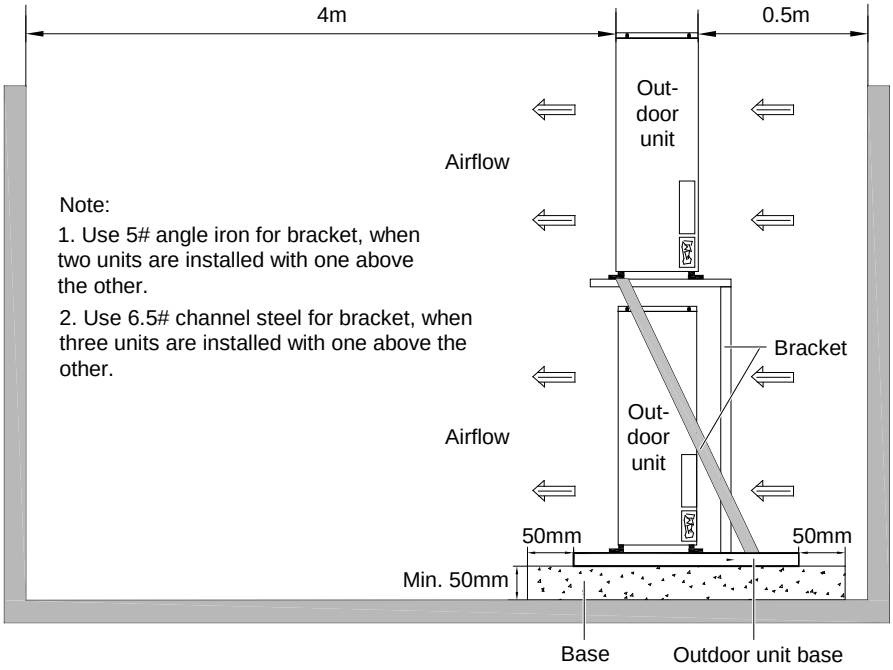


Figure 2-11 Installing multiple outdoor units with one above the other

2.6 Piping for AC Unit

2.6.1 General Principles

1. Use copper pipes with quick thread connector to connect the indoor unit and the outdoor unit. If the pipe length exceeds the standard pipe length (see Table 2-1) and straight copper pipe is used, piping joints must be brazed.

2. Follow standard industry procedures in selection and placement of pipe, system evacuation and charging with refrigerant (only when pipeline is too long). The standard refrigerant of the AC unit is R22.

3. Give considerations to pipeline pressure drop, oil return to the compressor, to avoid oil leakage and clogging in parts of the system and minimize noise and vibration to the greatest extend.

4. Consult Emerson before installation on whether measures such as using extended piping kit are needed, if the equivalent length exceeds 50m, or if the vertical distance between the indoor unit and the outdoor unit exceeds the values in Table 2-3.

Table 2-3 Vertical distance between indoor unit and outdoor unit

Relative position	Value
Outdoor unit installed higher than indoor unit	Maximum: 20m
Outdoor unit installed lower than indoor unit	Maximum: 5m

5. The equivalent length of each part is given in Table 2-4. The resistance loss caused by elbows and valves has been taken into consideration. The installer should confirm if these values are appropriate for site conditions.

Table 2-4 Equivalent length of each part

Liquid pipe OD (inch)	Equivalent length (m)		
	90° elbow	45° elbow	T-type three way
3/8	0.21	0.10	0.76
1/2	0.24	0.12	0.76
5/8	0.27	0.15	0.76
3/4	0.3	0.18	0.76
7/8	0.44	0.24	1.1
1-1/8	0.56	0.3	1.4

2.6.2 Installation Notes Of Connector

Be careful when connecting the quick thread connector. Read through the following steps before making connection.

1. Remove the dust-proof caps.

2. Carefully wipe coupling seats and threaded surface with a clean cloth.

3. Lubricate the male thread with refrigerant oil.

4. Thread the coupling halves together by hand to ensure that the threads mate properly.

5. Tighten the coupling body's hexagon nut and union valve until a definite resistance is felt.

6. Use a marking pen to draw a line lengthwise from the coupling union nut to the bulkhead. Tighten the nuts an additional quarter turn with two wrenches. The misalignment of the lines shows how much the coupling has been tightened. The final quarter turn is necessary to ensure that the joint does not leak. Two wrenches must be used to cooperate with each other during connection, because one wrench can damage the coupling copper lines easily.

The recommended torque values are listed in Table 2-5.

Table 2-5 Recommended torque value

Coupling size	Torque value (N·m)
5/8"	7 ~ 8
3/4", 7/8"	25 ~ 32

2.6.3 Required Pipe Connections

Refer to Figure 2-2, the required pipe connections are as follows:

- Refrigerant pipe between the indoor unit and the outdoor unit (discharge pipe and liquid pipe).
- Drain pipe of the indoor unit.

The following pipe connection is required if a humidifier is selected.

- Water supply pipe to the humidifier.

Note

Before starting-up, ensure that all pipe connections have been completed without leakage after engineering installation.

2.6.4 Connecting Refrigerant Pipe

Piping notes

1. The copper pipes provided by the factory are 5m (see Table 2-1). If longer pipes are required, contact Emerson or your sale agency.

2. The liquid pipe is the refrigerant liquid pipe of the outdoor unit outlet. So a reasonable pipe diameter and length should be selected for the liquid pipe to ensure that the pressure drop of the refrigerant liquid through the pipe during unit operation does not exceed 40kPa (5psi ~ 6psi).

3. The pipe should be installed and removed with care so that they will not get kinked or damaged. Use tube benders and make all bends before making connections to either end.

4. If jointing mode is needed, all refrigerant piping should be connected with silver-brazed joints.

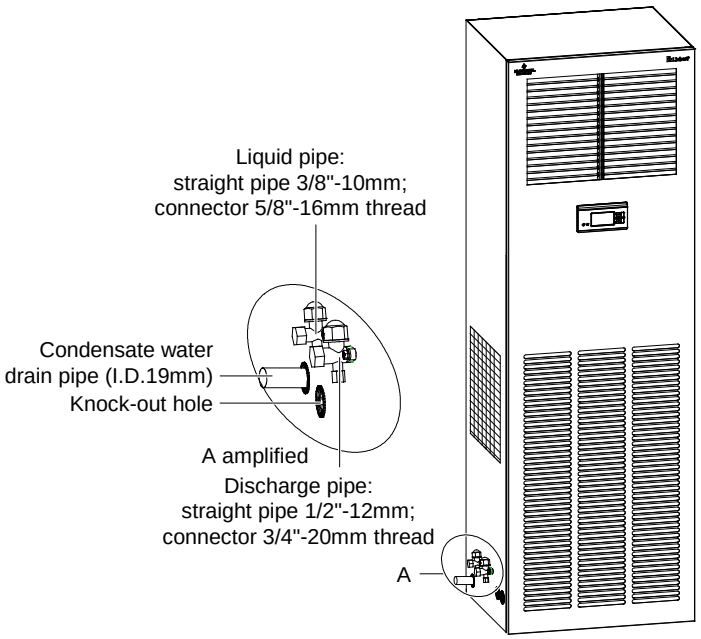
5. Check piping supports, leakage testing, dehydration of refrigerant pipes and evacuation before using. Use vibration isolating support to isolate the refrigeration pipes from the building.

6. Use a soft and flexible material to pack around the pipes to protect them from damage caused by going through openings in walls and to reduce vibration transmission.

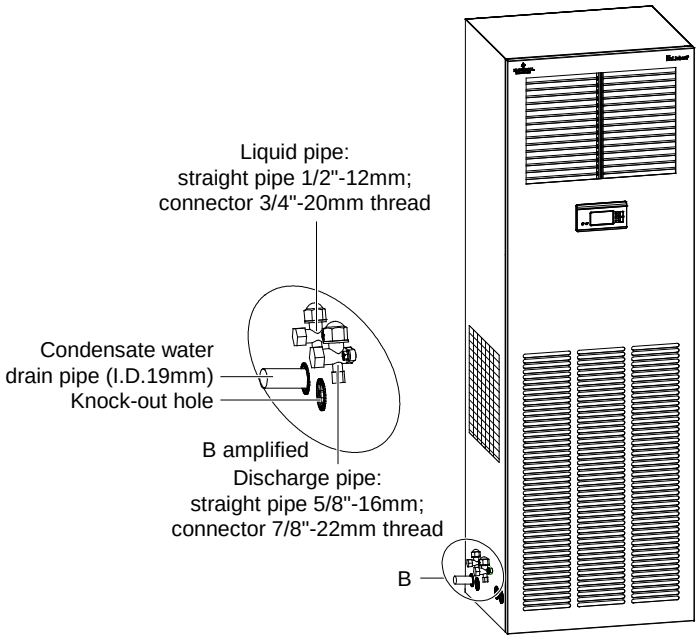
7. When installing the outdoor unit 7.5m higher than the indoor unit, a trap should be installed on the discharge pipe. This trap will retain refrigerant oil in the off cycle of the compressor. When the compressor starts, oil in the trap will be carried up the vertical riser and return to the compressor immediately.

Pipe connector position

The pipe connectors inside the indoor unit are shown in Figure 2-12.



Pipe connectors inside DME07kW indoor unit



Pipe connectors inside DME12kW indoor unit

Figure 2-12 Pipe connectors inside the indoor unit

Connecting discharge pipe

Connect one end of the discharge pipe to the discharge pipe connector of the indoor unit shown in Figure 2-12, and the other end to the discharge pipe connector of the outdoor unit shown in Figure 2-13.

Note

The discharge pipe is the pipe at the compressor discharging side. Its horizontal section should be sloped downward, away from the compressor, with a slope of at least 1:200 (5mm down for each 1m run). The discharge pipe should be insulated where it is routed in the conditioned space (including under a raised floor).

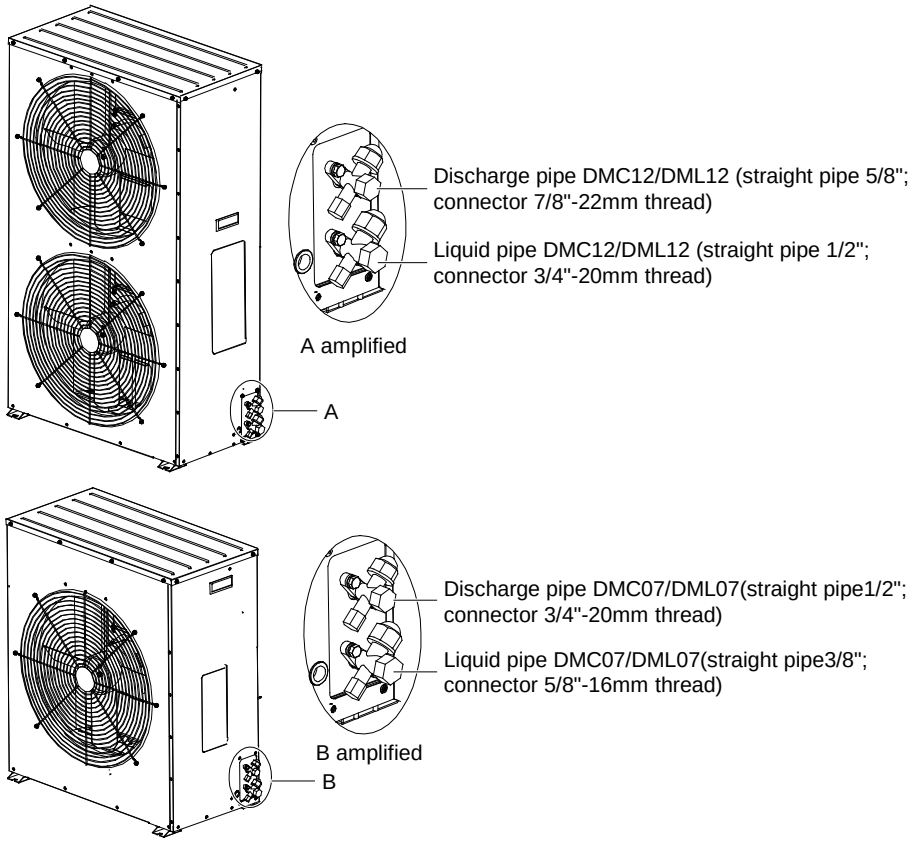

Discharge pipe DMC12/DML12 (straight pipe 5/8"; connector 7/8"-22mm thread)
Liquid pipe DMC12/DML12 (straight pipe 1/2"; connector 3/4"-20mm thread)
A amplified
A
Discharge pipe DMC07/DML07(straight pipe1/2"; connector 3/4"-20mm thread)
Liquid pipe DMC07/DML07(straight pipe3/8"; connector 5/8"-16mm thread)
B amplified
B

Figure 2-13 Refrigerant pipe connectors of outdoor unit

Connecting liquid pipe

Connect one end of the liquid pipe to the liquid pipe connector of the indoor unit shown in Figure 2-12, and the other end to the liquid pipe connector of the outdoor unit shown in Figure 2-13.

2.6.5 Connecting Drain Pipe Of Indoor Unit

Connect one end of the drain pipe to the connector of condensate water drain pipe shown in Figure 2-12. The drain pipe of the indoor unit uses a 20mm (3/4”) connector with hose barb connections, one of which is used to fasten the outdoor drain pipe. The drain pipe cannot be placed in position with freezing temperature. The drain pipe should be the full size of the drain pipe connector.

Note

The drain pipe of the indoor unit equipped with a humidifier must be able to endure the boiling water temperature. Use galvanized steel pipe, aluminum-plastic composite pipe with hot water type or PP-R polypropylene plastic pipe with hot water type as the drain pipe.

2.6.6 Connecting Humidifier Water Supply Pipe (If Applicable)

Connect one end of the humidifier water supply pipe to the connector of the humidifier water supply pipe shown in Figure 2-14, and the other end to the water tap through the knock-out hole of water inlet pipe shown in Figure 2-12.

The unit provides the humidifier with a 3/4” water supply pipe connector fitting. The rated water supply pressure range is 100kPa ~ 700kPa.

A shut-off valve should be installed on this pipe outside the unit to isolate the humidifier upon maintenance.

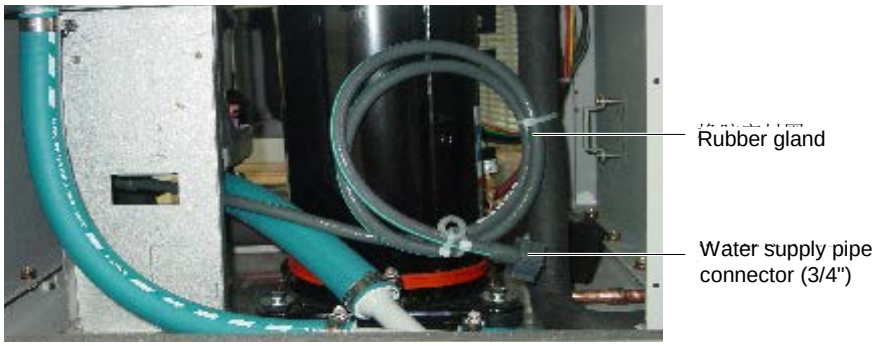


Figure 2-14 Humidifier water supply pipe connector of standard series indoor unit

2.7 Removing Transportation Fastener And Vibration Absorber

To protect partial components from damaging and distorting due to bumping, impact and resonation, fasteners and vibration absorbers are mounted at certain locations before delivery. Remove the fasteners and vibration absorbers before the installation and commissioning.

Removing transportation fixing plate of compressor

To reduce the compressor operation vibration and noise, the vibration absorbing cushions are added to the compressor base. However, such method cannot best restrain the equipment vibration during transportation, and may result in loosened connections and wearing of certain parts. To prevent this, three L shaped fixing plates are added to the compressor base, as shown in Figure 2-15.

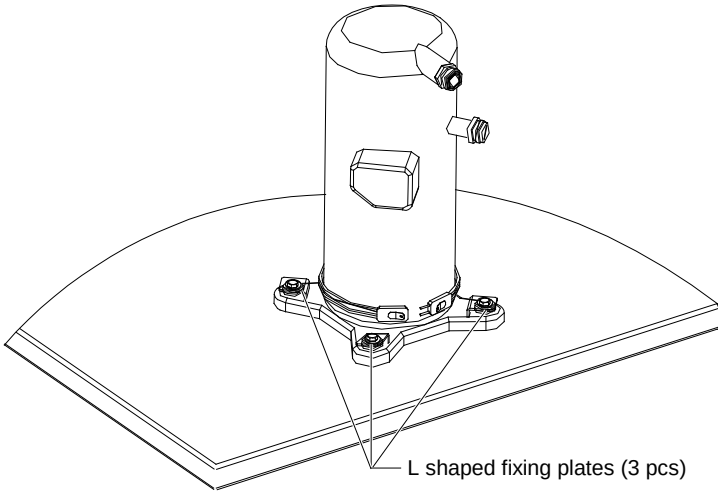


Figure 2-15 Positions of fixing plates

After the installation and before commissioning, remove the three L shaped fixing plates, and then restore the bolts and washers. The fastening torque of the bolts is (12 ± 1) N.m.

2.8 Adding Refrigerant For Long Pipe System

The Liebert_DM AC has been charged with appropriate refrigerant before delivery. If the connecting pipe between the indoor unit and the outdoor unit is longer than 10m, add refrigerant to the system in order to ensure normal system operation according to the following formula.

Adding refrigerant amount (kg) = adding refrigerant amount per meter of liquid pipe (kg/m) × total length of extended liquid pipe (m)

See Table 2-6 for the adding refrigerant amount per meter of liquid pipe.

Total length of extended liquid pipe (m) = total length of liquid pipe (m) - 5m

Table 2-6 Adding refrigerant amount per meter of liquid pipes with different ODs

Liquid pipe OD (inch)	Adding refrigerant amount per meter (kg/m)
3/8	0.060
1/2	0.112
5/8	0.181
3/4	0.261
7/8	0.362
1-1/8	0.618

2.9 Check List

1. Proper clearance for service access is maintained around the AC unit.

2. The equipment is placed vertically and mounting fasteners are fastened.

3. The pipes between the indoor unit and outdoor unit are completed. The quick connector valves of the indoor unit and outdoor unit are fully opened.

4. Condensate pump is installed (if required).

5. Drain pipe is connected.

6. Water supply pipe is connected to the humidifier (if required).

7. All pipe connectors are tight.

8. After installation, foreign materials in and around the equipment are removed (such as shipping materials, construction materials, tools, and so on)

9. Rotate the fan blades by hand, and the fan rotate freely without unusual noise.

You can start electrical installation after confirming the preceding items.

Chapter 3 Electrical Installation

This chapter introduces the electrical installation of the Liebert_DM AC, including task introduction, notes, connecting power cables of indoor unit and outdoor unit, connecting control cables, connecting energy-saving card and check list.

3.1 Task Introduction

Electrical connections to be made at the installation site are:

1. Power cable of the indoor unit: 3-ph (3 × L + N + PE).
2. Power cable of the outdoor unit: standard model (L + N + PE) and Lee-Temp model (L + L' + N + PE).
3. Unit monitoring and control cable (if remote control is applicable).
4. Energy-saving card cable (if applicable).

3.2 Notes

This AC is a professional device, used in industrial, commercial or other professional occasions. It is not for sale to general public. Its total rating power is larger than 1kW, complying with IEC61000-3-12 standard. A port with no less than 250 short circuit ratio is required between the user power and the grid. The user needs to get permission from the power supply department, to ensure that the AC is connected to a power with no less than 250 short circuit ratio.

1. All power and control wiring and ground connections must be in accordance with the national and local electrician regulations.
2. Refer to unit nameplate for full load current. Cable size should be in accordance with the local wiring rules.
3. Mains requirement: 3-ph (380Vac, 50Hz, 3 × L + N + PE).
4. The electrical installation must be completed by trained professionals.
5. Before the wiring, use a voltmeter to measure the power voltage and make sure that the power has been switched off.
6. An all-pole disconnection device must be configured upstream the device to ensure operation safety.
7. If the mains cord is damaged, it must be replaced by professional maintenance personnel.

3.3 Connecting Power Cable Of Indoor Unit

The unit does not have a power cable of indoor unit according to standard configuration, please contact Emerson or purchase it on your own. The recommended cable size is not less than 10AWG (6mm^2).

Use the provided inner hexagon wrench to loosen the fixing screws of the indoor unit door, lift and loose the front door, and then disconnect the display board connecting terminals, after that you can remove the front door. At this point, the power output terminal of the indoor unit is revealed at the left side panel, as shown in Figure 3-1.

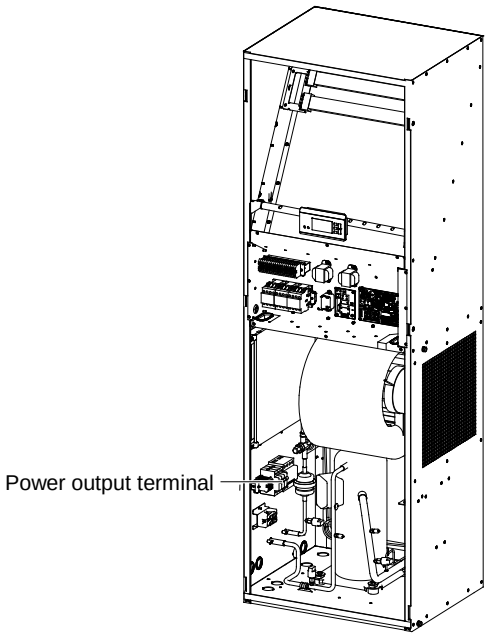


Figure 3-1 Power connection position of indoor unit

Lead the power cable through the cabling hole, connect it to the power output terminal of the indoor unit, and fasten it with a cable clamp, as shown in Figure 3-2. Connect the other end to the AC power outside the AC system.

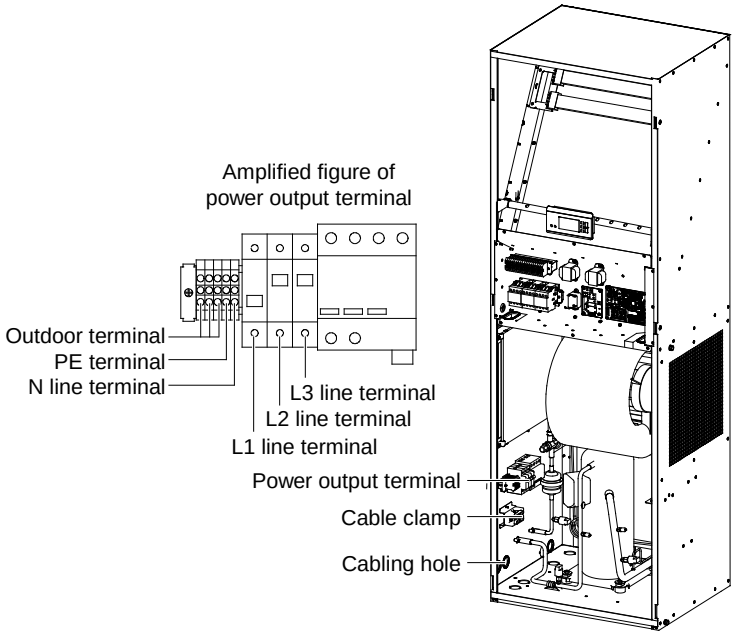


Figure 3-2 Input and output power wiring of indoor unit

Note

1. Use copper cables only and ensure that all connections are solid while wiring.
2. Make sure that the power voltage matches the voltage specified on the unit nameplate.
3. Install a disconnect switch before the power input of the indoor unit to isolate the unit for maintenance. Connect the power cable to the disconnect switch and then to the unit.
4. Cut off the power to the unit before maintenance inside the unit because the unit contains high voltage.

3.4 Connecting Power Cable Of Outdoor Unit

The standard length of the outdoor unit power cable is 8m, if you need a longer cable, please contact Emerson or purchase it on your own. The recommended cable size is not less than 18AWG (0.75mm^2).

Connect one end of the outdoor unit power cable to the power output terminal of the indoor unit shown in Figure 3-2, and the other end to the power connection terminals of the outdoor unit shown in Figure 3-3 and Figure 3-4.

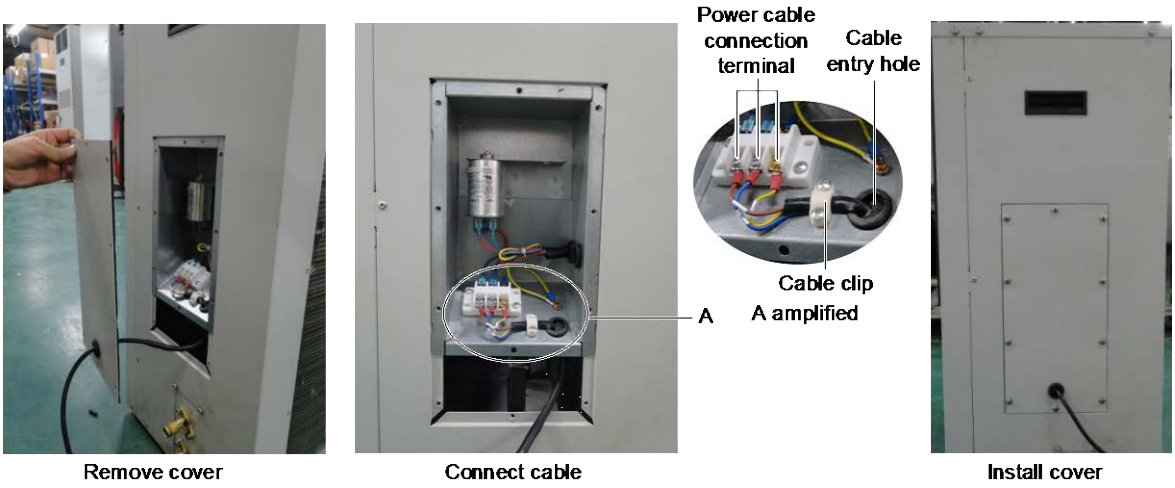


Figure 3-3 Power connection figure of standard model outdoor unit

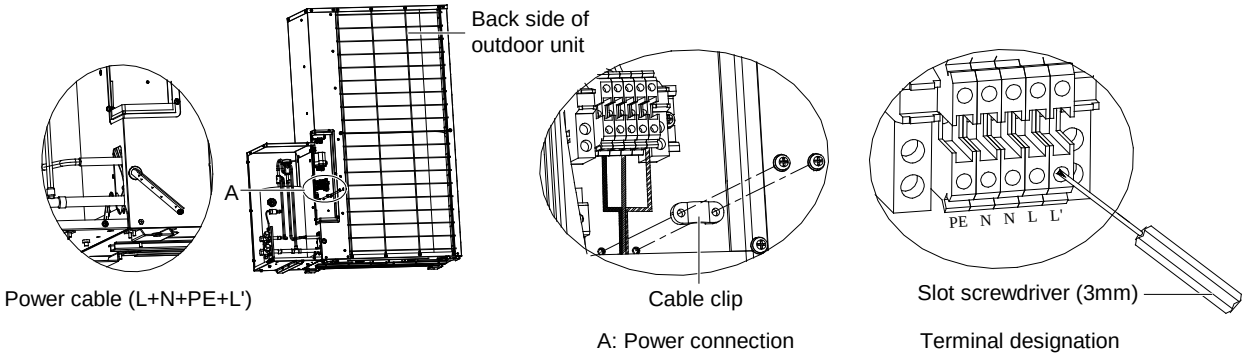


Figure 3-4 Power connection figure of Lee-Temp model outdoor unit

3.5 Connecting Control Cable

3.5.1 Connecting Control Terminals

The control terminals are located on the PCB and terminal block of the electrical control box, as shown in Figure 3-5.

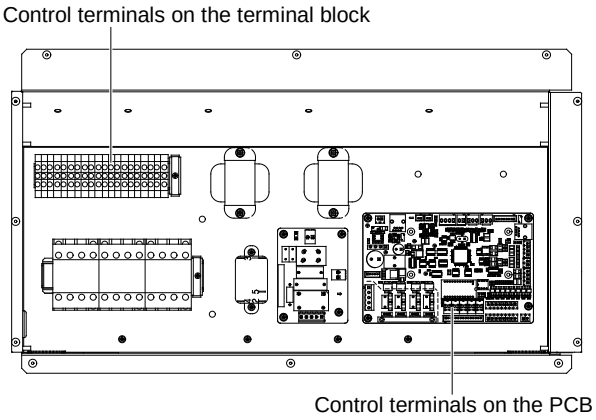


Figure 3-5 Control terminal position

The control terminals on the PCB are shown in Figure 3-6; the control terminals on the terminal block are shown in Figure 3-7.

Note

Before connecting the control cables, connection personnel must take anti-static measure.

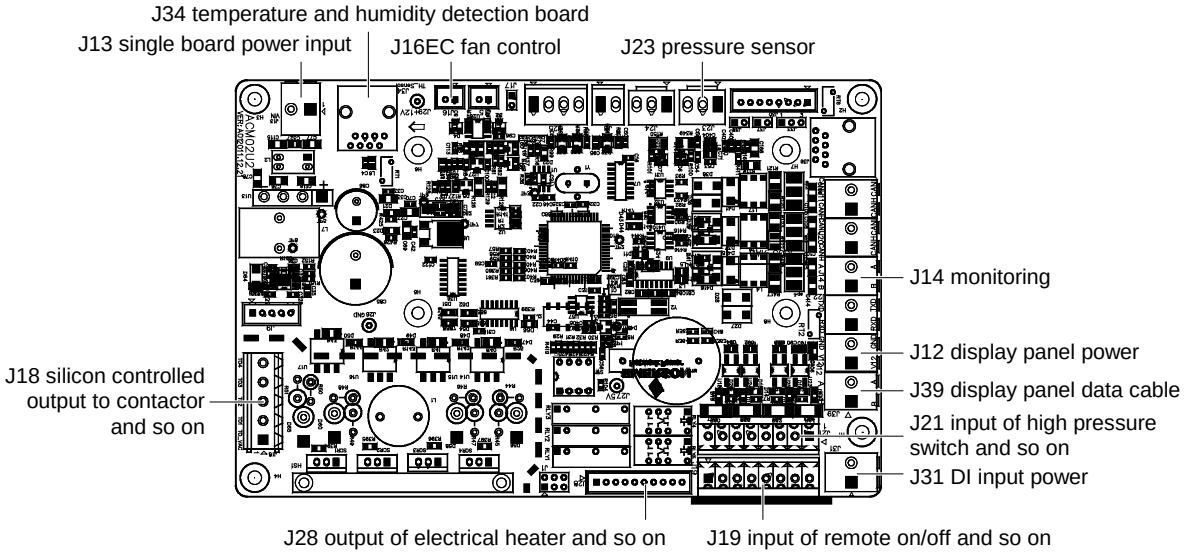

J34 temperature and humidity detection board
J13 single board power input
J16EC fan control
J23 pressure sensor
J14 monitoring
J12 display panel power
J39 display panel data cable
J21 input of high pressure switch and so on
J31 DI input power
J18 silicon controlled output to contactor and so on
J28 output of electrical heater and so on
J19 input of remote on/off and so on

Figure 3-6 Control terminals on the PCB

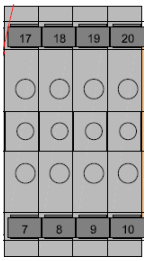


Figure 3-7 Control terminals on the terminal block

Remote shutdown

The PIN5 and PIN6 of the remote shutdown J19 can be used to remotely control the unit ON/OFF status, stopping the unit operation upon special moment. If the input of remote shutdown terminal is shorted and the AC unit power is switched on, the AC unit outputs normally. If the terminal is open, the AC unit will stop outputting. The remote shutdown terminal has been shorted before delivery. If the control cable of remote shutdown needs to be connected in site, remove the short cable and connect the outer controller to the remote shutdown terminal.

SPD (Customer 1 terminal)

When the PIN1 and PIN2 of the customer 1 terminal (control terminal) J19 are not connected to SPD signal, they can connect with an alarm signal except for the AC system. Any outer alarm signal with NO dry contact can be connected with the customer terminal. After the outer alarm signal is connected, you should set the corresponding customer alarm information in micro-processing controller. For details, refer to *Customer Alarm* in *5.6.2 Alarm Menu*. If no alarm signal is connected, the input state of the customer terminal is the same as the settings. If the outer alarm is generated, the input state of the customer terminal is different from the settings. The AC system will generate an audible alarm and LCD screen on the micro-processing controller will display the corresponding alarm information. If a computer using Emerson host monitoring software is connected, the alarm will be displayed on the computer too.

If the power SPD is configured, the PIN1 and PIN2 of the customer 1 terminal J19 have been connected with alarm signal of power SPD in factory and the alarm is set to be normally closed (NC).

General alarm terminal

The general alarm relay, connected with 19 and 20 on the terminal block (see Figure 3-7), has a set of NC dry contact, which can be set to normally closed by software. When serious alarm is generated, the contact is closed. This can be used to send a remote alarm, sending signals to the building management system or dialing the paging system automatically.

Lead/standby switch over and requirement terminals

The PIN17 and PIN18 of the lead/standby switch over terminal and the PIN7 and PIN8 of the requirement terminal J19 (see Figure 3-7) are used to connect two AC units working in master-slave mode. The connection mode is shown in Figure 3-8.

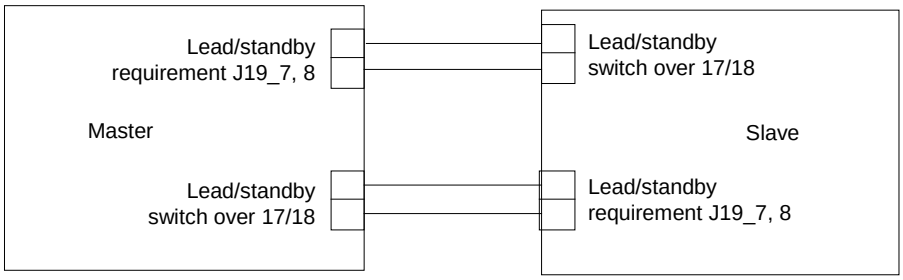


Figure 3-8 Connection in master-slave mode

3.5.2 Connecting Monitoring Port Cable

The RS485 port of the Liebert_DM indoor unit is located on the J39 terminal on the PCB (see Figure 3-6), use a twisted-pair communication cable to connect it with the upper machine.

Multiple Liebert_DM ACs can realize simultaneous multi-units monitoring through RS485 bus. Taking RDU-Cooling host monitoring software developed by Emerson for example, Figure 3-9 introduces a networking mode of RS485 bus monitoring two AC units simultaneously.

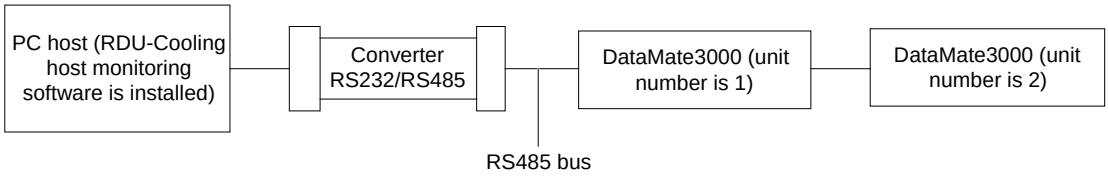

PC host (RDU-Cooling host monitoring software is installed)
Converter RS232/RS485
DataMate3000 (unit number is 1)
DataMate3000 (unit number is 2)
RS485 bus

Figure 3-9 Networking mode monitoring two AC units

3.6 Connecting Energy-Saving Card

The energy-saving card is shown in Figure 3-10.

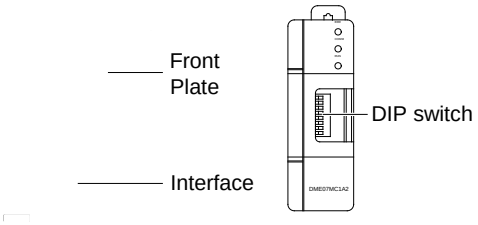


Figure 3-10 Energy-saving card

Use 4-core shielded cables with a recommended cable diameter not less than 20AWG (0.52mm^2) to connect the energy-saving card. Make sure that the two ends of the shielded layer and the energy-saving card are grounded reliably to increase the anti-interference ability. The grounding cable should not exceed 10cm, and the cable size should be above 2mm^2. Make sure that all connections are tight.

Use the energy-saving card according to the following steps:

1. Open the front plate of the energy-saving card plastic shell and take out the energy-saving card board along the card slot inside the plastic shell. The board is shown in Figure 3-11.

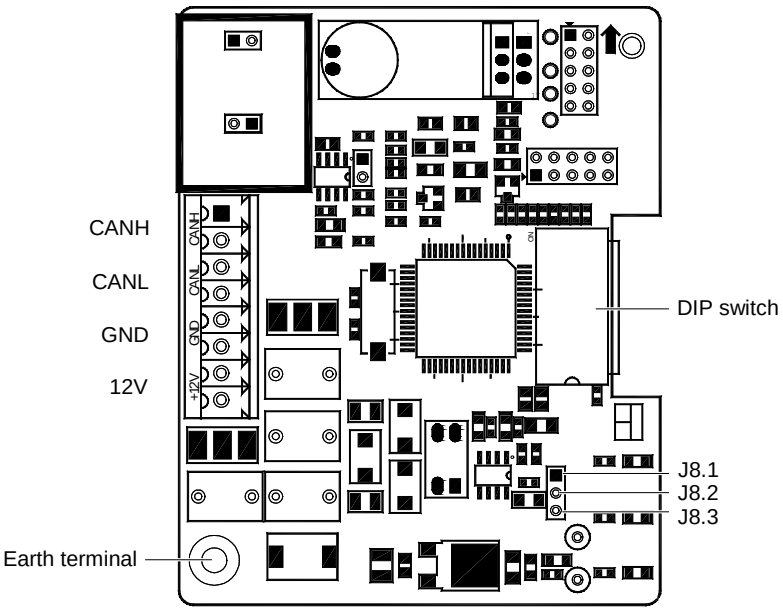


Figure 3-11 Energy-saving card board

2. Short terminals J8.1 and J8.2 in furthest energy-saving card and short terminals J8.2 and J8.3 in other cards.

3. Ground the cards reliably.

4. Put the energy-saving card into the shell along the card slot and replace the front plate.

5. Use 4-core shielded cables to connect the Liebert_DM control board on back of the front door of the indoor unit to 12V, GND, CANH and CANL interfaces of the energy-saving card, and snap the accessory magnetic buckle on the shield cable close to the control board end.

6. Use 4-core shielded cables to serially connect 12V, GND, CANH and CANL interfaces of other cards (if more than one card is used).

7. Ground the shielded cables reliably.

8. Set bits 1 and 2 of the DIP switch to card address and other bits to 0 (ON: 0, OFF: 1).

9. Fix the energy-saving card in position with heavy room temperature load with screws or the card slot on shell.

10. Enter **Sleep Mod** menu to view whether the temperature of the energy-saving card is normal.

Figure 3-12 and Figure 3-13 indicate the connection modes of single card and multi-cards respectively.

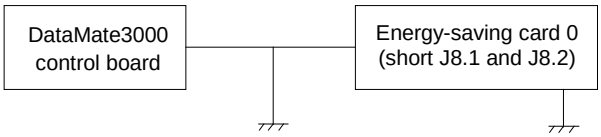


Figure 3-12 Connection of single card

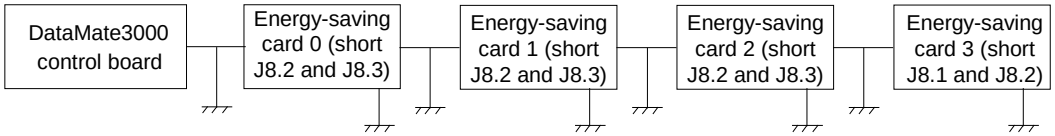


Figure 3-13 Connection of multi-cards

3.7 Check list

After the system electrical installation is completed, the following requirements should be met:

1. No open-circuit or short-circuit in the electrical connection exists.
2. The power voltage is the same as the rated voltage on the unit nameplate.
3. The power cables and earth cables connected to the disconnect switch, indoor unit and outdoor unit are connected properly.
4. The circuit breakers or fuses have proper ratings for equipment installed.
5. The control connections are completed.
6. All wiring and connector connections are tight. The fixing bolts are tight.

After confirming the preceding points, you can plug the display board connecting terminals, restore the front door, and then start start-up inspection & function testing.

Chapter 4 System Testing

This chapter introduces the start-up inspection and function testing of the Liebert_DM AC.

4.1 Start-Up Inspection

Before system starting-up, inspect the states of parts following the requirements listed in Table 4-1.

Table 4-1 Inspection items before starting-up

Item	Inspection requirements
Panel	No damage, well insulated and clean
Filter	Installed in place and reliably, no damage and clean
Power supply	Measure and record the voltage before the system is powered on. Power cables are connected reliably
Outdoor unit	The outdoor unit is installed reasonably; the pipes are supported and sloped down properly; the trap is installed in a correct position
Fan	No obstruction material in inlet and outlet area
Humidifier (if applicable)	Water supply pipe and drain pipe are connected; water level sensor is secured correctly
Heater (if applicable)	Heating components are secured reliably
Power SPD (if applicable)	The module is secured reliably
Controller	The wiring connections are tight

After inspecting and confirming the above items, you can power on the AC unit. The inspection requirements after starting-up are listed in Table 4-2.

Table 4-2 Inspection items after starting-up

Item	Inspection requirements
Fan	The rotation direction is correct; record the rated full load current and actual current of the fan motor
Heater (if applicable)	Record the heater current
Outdoor fan	The rotation direction is correct; record the rated full load current and actual current of the fan motor
Others	Record the user setpoints, return air temperature, suction pressure, discharge pressure, compressor current and discharge air temperature

4.2 Function Testing

Note

The AC unit carries hazardous voltage. Cut off the power before testing the equipment. Test should be done under the guidance of Emerson professional maintenance personnel or trained maintenance personnel.

4.2.1 Cooling

Adjust the temperature setpoint according to *5.6.3 Set Points* to 5°C (10°F) lower than the indoor temperature. Then the control system should trigger the cooling demand and the compressor starts to work. After at least 3min of cooling, adjust the temperature setpoint to 5°C (10°F) higher than the indoor temperature. If the compressor stops working, it means that the cooling function is normal.

Note

Restore the temperature setpoint to the default or the original value after the test.

4.2.2 Heating

Adjust the temperature setpoint according to *5.6.3 Set Points* to 5°C (10°F) higher than the indoor temperature. Then the control system should trigger the heating demand and the heater starts to work. Adjust the temperature

setpoint to 5°C (10°F) lower than the indoor temperature. If the heater stops working, it means that the heating function is normal.

🕮 **Note**

Restore the temperature setpoint to the default or the original value after the test.

4.2.3 Humidifying

Adjust the humidity setpoint according to *5.6.3 Set Points* to 10% higher than the indoor relative humidity. Then the control system should trigger the humidifying demand and the humidifier starts to work. Adjust the humidity setpoint to 10% lower than the indoor relative humidity. If the humidifier stops working, it means that the humidifying function is normal.

🕮 **Note**

Restore the humidity setpoint to the default or the original value after the test.

4.2.4 Dehumidifying

Adjust the humidity setpoint according to *5.6.3 Set Points* to 10% lower than the indoor relative humidity. Then the control system should trigger the dehumidification demand and the fan runs at low speed. Adjust the humidity setpoint to 10% higher than the indoor relative humidity. If the fan automatically runs at high speed, it means that the dehumidification function is normal. Note that during the testing process, if the indoor temperature is 3°C higher than the temperature setpoint, the system may enter a forced cooling mode and the dehumidification demand will not be responded.

🕮 **Note**

Restore the humidity setpoint to the default or the original value after the test.

4.2.5 Checking Refrigerant Charge Capacity Of Lee-Temp Outdoor Unit

The Lee-Temp outdoor unit has been charged with refrigerant before delivery. Check whether the refrigerant charge capacity is proper after powering on by using the following method.

When the high pressure is not lower than 240psig (16.5bar), the liquid level of the refrigerant will reach the 1/2 point of the tank sight glass. When the ambient temperature is low and the high pressure cannot meet the requirement, you can block part of the upside and downside of the air intake uniformly to obtain required pressure.

If the liquid level cannot meet the requirement, you should discharge or refill the refrigerant for a proper liquid level length. Reclaim the discharged refrigerant according to correlative requirement.

Chapter 5 Micro-Processing Controller

This chapter gives a detailed description on feature, appearance, LCD screen, control buttons, control interface and menu structure of the Liebert_DM AC.

5.1 Feature

The micro-processing controller has the following features:

1. Adopt menu operation. It can monitor and display the operation status of precise cooling AC unit to keep the environment within a setting range.
2. Adopt a 128 × 64 dot LCD screen with white backlight. The user interface is easy-to-use.
3. Provide three-level password protection to prevent unauthorized operation effectively.
4. Provide the functions, including self-recovery upon power failure, high-voltage & low-voltage protection, phase loss protection and automatic phase-sequence switching upon anti-phase.
5. Accurately know the running time of important components through menu operation.
6. The expert-level fault diagnose system can automatically display the current fault information to facilitate maintenance personnel in equipment maintenance.
7. Store up to 200 historical alarm records.
8. Configured with an RS485 port.

5.2 Appearance

The micro-processing controller panel is shown in Figure 5-1.

Figure 5-1 Micro-processing controller panel

5.3 LCD Screen

The LCD screen displays English menus with white backlight. When the system is operating normally, it displays the current temperature & humidity (whether to display humidity is optional. Only the unit configured with a humidifier can display humidity, see *Select Options* in *5.6.5 System Menu* for details), unit output status (cooling, heating, dehumidifying and humidifying), unit mode (single, lead, standby), unit operation status (running, standby, locked), alarm information and current date & time, as shown in Figure 5-2.

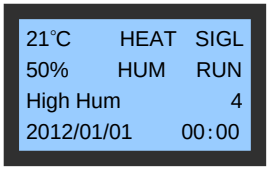


Figure 5-2 LCD screen

More detailed operating status of certain component and alarm information are available from the Main Menu screen. The selected menu item will be highlighted while browsing. The digit to be changed will be highlighted while you are changing setting.

5.4 Control Buttons

5.4.1 Function Description

The micro-processing controller provides five control buttons, as shown in Figure 5-3.

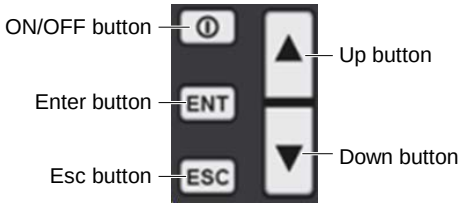


Figure 5-3 Control keypad

The functions of the control buttons are described in Table 5-1.

Table 5-1 Function descriptions of control buttons

Control button	Function descriptions
ON/OFF button	Press this button for 3s to turn on or off the unit
Enter button (ENT)	Enter the selected menu screen. Validate the parameter setting value
Esc button (ESC)	Exit the current menu and return to the Normal screen or previous menu screen. Abort parameter change; silence the audible alarm
Up button	Move the cursor up or increase the parameter value. For a toggle selection: scroll through the options. For a multi-screen menu: scroll up the screen
Down button	Move the cursor down or decrease the parameter value. For a toggle selection: scroll through the options. For a multi-screen menu: scroll down the screen

5.4.2 Operation Example

Example 1: Inputting password to enter the Main Menu

After the unit is started up, you can enter the Main Menu through conducting the following operations on the Normal screen.

1. Press the Enter button to enter the Password screen.
2. Press the Enter button to highlight the input data field in the Password screen.
3. Press the Up or Down button to change the current password number.
4. Press the Enter button to confirm the password and enter the **Main Menu** screen.

Example 2: changing parameters

Taking **Hi Temp** in **Alarm Output** screen as an example, the procedures are as follows:

1. Press the Up or Down button to move the cursor on the **Alarm Menu** menu in the **Main Menu** screen.
2. Press the Enter button to enter the **Alarm Menu** menu.
3. Press the Up or Down button to move the cursor on **Alarm Output** in the **Alarm Menu** screen.
4. Press the Enter button to enter the **Alarm Output** screen.
5. Press the Up or Down button to move the cursor on **Hi Temp**.
6. Press the Enter button to highlight the parameter field of **Hi Temp**.
7. Press the Up or Down button to select the parameter option.
8. After selecting, press the Enter button to confirm. The parameter will take effect.
9. Press the Esc button to return to the previous menu screen.

Note

After changing the parameter, if you do not press the Enter button to validate the changed parameter, the change will be invalid.

5.5 Control Screen

5.5.1 ON Screen

After the AC unit is powered on, the LCD screen will display the ON screen, as shown in Figure 5-4.

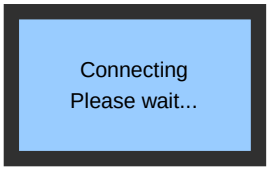


Figure 5-4 ON screen

5.5.2 Normal Screen

After the AC unit is powered on, the Normal screen will be displayed after 10 seconds (default) for heat startup delay or through pressing the Enter button directly, as shown in Figure 5-5. The Normal screen displays the following information: the current temperature and humidity, unit operation state (cooling, heating, dehumidifying, humidifying), unit mode (single, lead, standby), unit operation status (running, standby, locked, off, sleep), alarm information and current date & time.

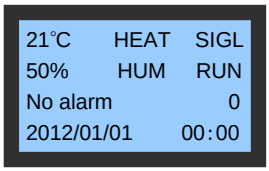


Figure 5-5 Normal screen

5.5.3 Password Screen

Press the Enter button on the Normal screen, and the Password screen will appear, as shown in Figure 5-6.

Figure 5-6 Password screen

Three levels of passwords are provided for accessing the menus. The detailed descriptions are listed in Table 5-2.

Table 5-2 Password level

Password level	User	Initial password	Remark
Level 1	General operator	0001	Browse all menu information. Only set temperature and humidity setpoints (see Figure 5-12) and cannot change any values and settings
Level 2	Maintenance personnel	-	Set all parameters
Level 3	Factory technician	-	-

For detailed operation on entering the password, refer to *5.4.2 Operation Example*. If entering a wrong password, you can only view the menu, but cannot change the settings. In this case, you can press the Esc button to return to the Normal screen, and then press the Enter button to enter the Password screen again.

Note

If pressing the Enter button in the Password screen instead of inputting any password, you can only view the menu settings but cannot change any parameters.

5.6 Menu Structure

5.6.1 Main Menu

Input the password in the Password screen and confirm, and the Main Menu screen will appear, as shown in Figure 5-7. For detailed menu structure, refer to *Appendix 1 Menu Structure.*

After a certain menu is selected, the menu item will be highlighted. Some menu items are settable and others are not. For detailed setting procedures, refer to *5.4.2 Operation Example*. For the setting ranges of the settable menu items, refer to *Appendix 2 Parameter Setting Table*.

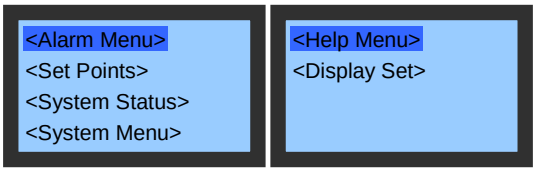


Figure 5-7 Main Menu screen

The menu items in the Main Menu screen are described in Table 5-3.

Table 5-3 Main Menu description

Menu item	Descriptions
Alarm Menu	Set alarm parameters; browse alarm historical records and alarm status records
Set Points	Set temperature & humidity setpoints and their sensitivities
System Status	Browse ambient temperature & humidity, system output status and system running records; browse and set system time
System Menu	Set system parameters and system options; calibrate sensor; change password; output system diagnose; restore factory parameters; configure optional function
Help Menu	Browse factory information, product information and maintenance information
Display Set	Adjust the screen contrast

5.6.2 Alarm Menu

Select **Alarm Menu** on Main Menu screen to enter the screen shown in Figure 5-8. Press the Up or Down button to scroll up or down the menu items.

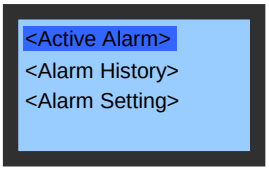


Figure 5-8 Alarm Menu screen

Active Alarm

The Active Alarm menu is used to monitor the present alarm status of the AC unit and prompt **No Alarm** or detailed alarm status information.

The detailed alarm status information includes XX/YY, alarm type and alarm start time, as shown in Figure 5-9. XX is the serial number of alarm status record and YY is the total number of alarm status record.

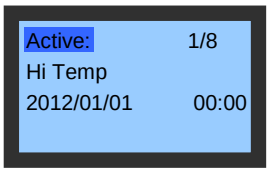


Figure 5-9 Active Alarm screen

Note

1. The latest alarm SN is the biggest number. Press the Up or Down button to scroll through the alarm status records if more than one alarm is activated.
2. The alarm status records will be automatically cleared upon system power-off.

Alarm History

The Alarm History menu is used to view the historical alarm record of the AC unit, including XX/YY, alarm type, alarm start time and alarm end time (if the alarm is not ended, the screen displays **Not Ended Yet**), as shown in Figure 5-10. XX is the serial number of the historical alarm record and YY is the total number of the historical alarm records.

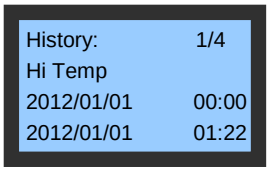


Figure 5-10 Alarm History screen

Note

1. Press the Up or Down button to scroll through the historical alarm records if more than one alarm is activated.
2. Up to 200 historical alarm records can be stored. They will not be cleared upon system power-off.

Alarm Setting

The Alarm Setting settings will not be lost when the power fails. The Alarm Setting screen is shown in Figure 5-11. For detailed setting ranges, refer to *Appendix 2 Parameter Setting Table.*

Note

It is not recommended to change the defaults. If the change is necessary, change them under the guidance of the trained professionals.

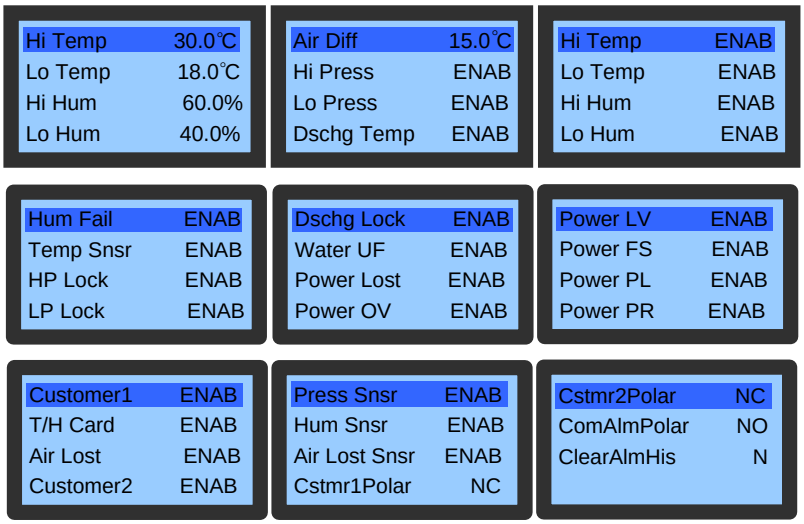


Figure 5-11 Alarm Setting screen

Table 5-4 Alarm output logic

Settings	Alarm history record	Alarm status record	Audible alarm	Alarm prompt
ENAB	Yes	Yes	Yes	Yes
DISA	Yes	Yes	No	No
OFF	No	No	No	No

Note

The alarms **Hi Press**, **Lo Press** and **Hi Temp** are serious fault alarms. So they cannot be set to **OFF**, but can only be set to **ENAB** and **DISA**.

Customer Alarm

The AC unit provides two customer alarms, including customer 1 and customer 2, corresponding to PIN1, 2 of the control terminals J19 and PIN5, 6 of J19 respectively.

The customer alarm can be set to 'NO' or 'NC'. You must set them according to the actual alarm signal of the control terminals. If the power SPD is selected, the customer 1 alarm terminal has been connected with power SPD alarm signal before delivery and the customer 1 has been set to 'NC'.

5.6.3 Set Points

Select **Set Points** in Main Menu to enter the Set Points menu, as shown in Figure 5-12.

The Set Points settings will not be lost when the power fails. For detailed setting ranges, refer to *Appendix 2 Parameter Setting Table.*

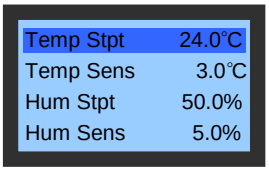


Figure 5-12 Set Points menu

5.6.4 System Status

Select Main Menu -> System Status to enter the System Status menu, as shown in Figure 5-13.

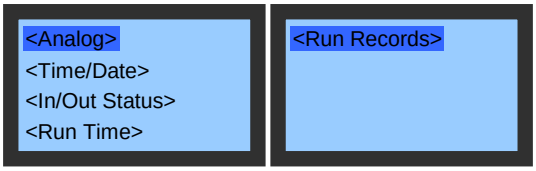


Figure 5-13 System Status screen

Analog

The Analog menu displays the indoor temperature & humidity, 3-ph voltage & frequency and condenser pressure with a decimal in real time, as shown in Figure 5-14.

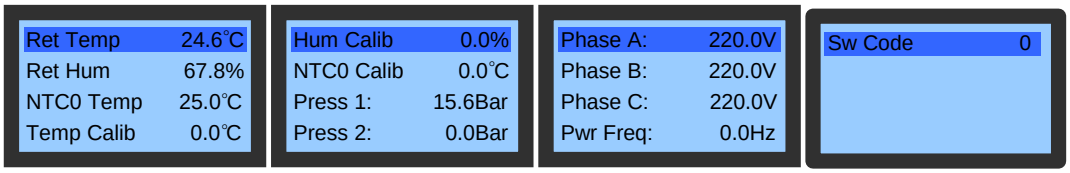


Figure 5-14 Analog screen

Time/Date

The Time/Date screen displays the current time and date of the system in the format of Year/Month/Date and Hour/Minute/Second, as shown in Figure 5-15.

If the change is successful, the current time and date will be changed to the set time automatically. Otherwise, the current time and date will not be changed.

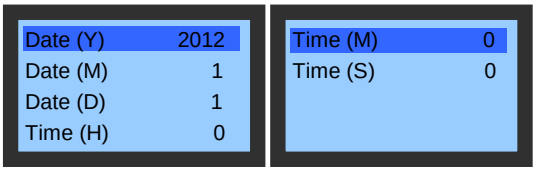


Figure 5-15 Time/Date screen

In/Out Status

The In/Out Status screen is shown in Figure 5-16. You can browse the current input and output status of the unit on the screen. If **Manual Run Enab** is set to 'YES', the output can be controlled manually. If the manual output is inner fan output, the rest outputs will be closed; if the manual output is electrical heater output, the inner fans will be started up simultaneously and the rest outputs will be closed. The system will quit the manual mode in an hour if you do not quit.

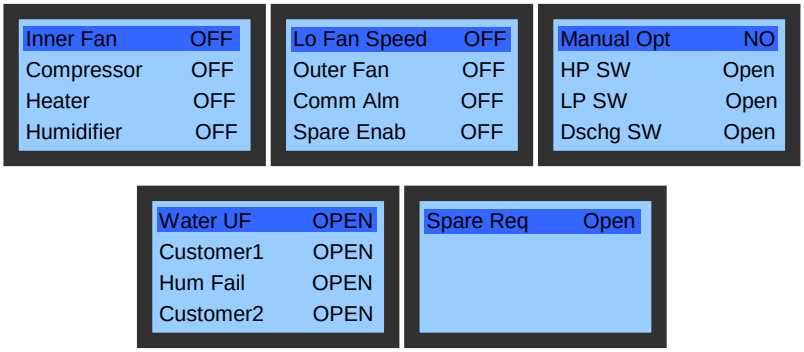


Figure 5-16 In/Out Status screen

Run Time

The Run Time screen is shown in Figure 5-17. You can browse the current operation hours of the equipment on the screen.

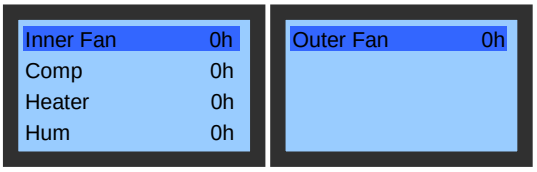


Figure 5-17 Run Time screen

Run Records

The Run Records screen is shown in Figure 5-18. You can browse the start and stop records of the equipment on the screen.

Figure 5-18 Run Records screen

5.6.5 System Menu

Select Main Menu -> System Menu to enter the System Menu screen, as shown in Figure 5-19.

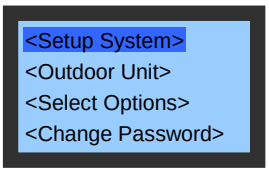


Figure 5-19 System Menu screen

Setup System

The Setup System settings will not be lost when the power fails. The menu screen is shown in Figure 5-20. For detailed setting ranges, refer to *Appendix 2 Parameter Setting Table.*

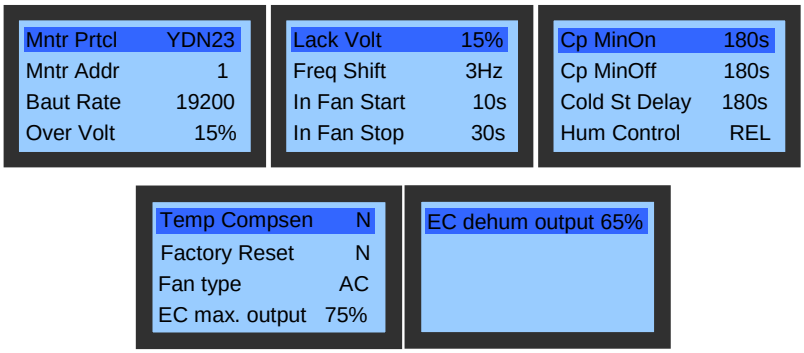


Figure 5-20 Setup System screen

Factory Reset

Use Up or Down button to move the cursor to **Factory Reset** in the Setup System menu and press the Enter button. Use Up or Down button to set it to **YES** or **No** and press the Enter button to validate the setting. If **Yes** is selected, all system setpoints will be restored to the factory-recommended values, but the operation time and history alarm records will not be cleared.

Note

Because the **Factory Reset** will clear all setpoints configured by the user and the AC unit will be turned off, be cautious to use it.

Outdoor Unit

The menu screen is shown in Figure 5-21.

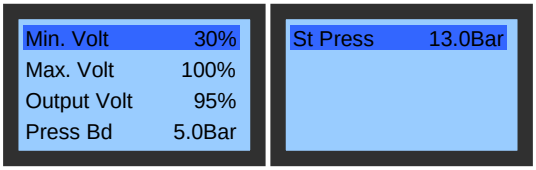


Figure 5-21 Outdoor Unit menu

Select Options

The Select Options settings will not be lost when the power fails. The menu screen is shown in Figure 5-22. For detailed setting range, refer to *Appendix 2 Parameter Setting Table*.

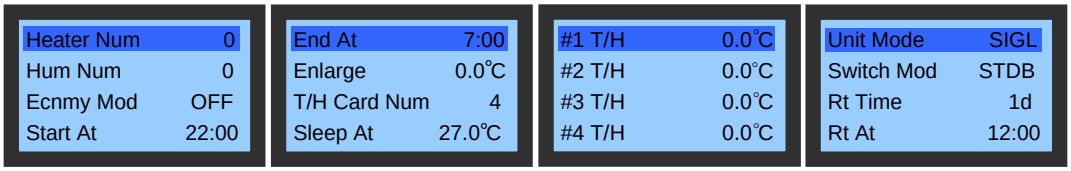


Figure 5-22 Select Options screen

Note

1. Only when the energy-saving card No. is not zero, the Sleep Mod can start. Only the Liebert_DM AC equipped with more than one energy-saving card (dedicated) can enter the Sleep Mod. The lead unit and standby unit cannot use the same card.

2. When a lead unit and a standby unit are available, you must set one of them as the lead unit. If you set both of them as the standby units, they cannot work normally accordingly.

Change Password

The Change Password setting will not be lost when the power fails. The menu screen is shown in Figure 5-23.

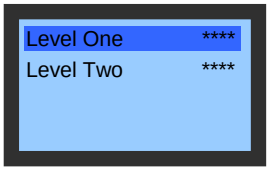


Figure 5-23 Change Password screen

5.6.6 Help Menu

Select Main Menu -> Help Menu to enter the Help Menu screen, as shown in Figure 5-24. The Enab Open is not disclosed to the users.

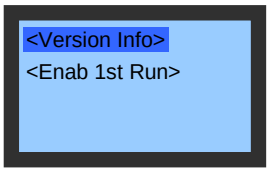


Figure 5-24 Help Menu screen

Version Info

The Version Info menu is used to browse the version, as shown in Figure 5-25.

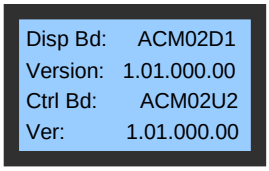


Figure 5-25 Version Info screen

5.6.7 Display Set

Select Main Menu -> Display Set to enter the Display Set screen, as shown in Figure 5-26.

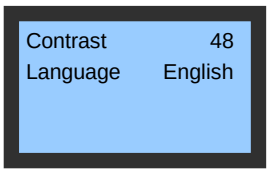


Figure 5-26 Display Set screen

Chapter 6 System Maintenance

This chapter expounds the system maintenance of the Liebert_DM AC, including electric inspection, indoor unit maintenance, outdoor unit maintenance and maintenance inspection checklist.

Note

1. Switch off the circuit breaker and cut off the unit power before maintenance unless the power is necessary for the commissioning item.

2. Even if the indoor unit power is disconnected, the indoor unit fan, heater, outdoor unit fan and humidifier may still carry hazardous voltage. So switch off the circuit breaker to disconnect the power supply of the system before maintenance.

6.1 Electric Inspection

Visually inspect the control board, power detection board, filter board, display board and THS board on a semi-annual basis for any loose electric connection and circuit corrosion.

The micro-processing controller has five circuit boards which jointly complete the system fault detection, input and output.

Inspect the boards one by one according to the procedures below:

1. Do unit electric insulation test to find failed contacts and deal with them.

2. Statically check and test if the contactor is flexible without blocking.

3. Clean the electric and control components with a brush or compressed dry air.

4. Check if the contactor contacts have arc or burned phenomenon when closing.

5. Tighten all electric contacts.

6. Check if the temperature of all MCBs and contactor contacts become higher.

Note

All circuit boards are not hot-pluggable. Big instant current will be produced when the board is plugged or unplugged with powering on and it may lead to unrepairable damage to the circuit. The control board can only be maintained after the micro-processing controller is powered off.

6.2 Indoor Unit Maintenance

6.2.1 Filter

The filter is a consumable. Its replacement interval is directly related to the seal and cleanness status of the equipment room. In order to maintain efficient operation, the filter should be checked monthly and be replaced or washed as required.

The filters of the indoor unit are installed on the front door and side panel.

- Filter on the front door

Unscrew the fixing screws on the filter stator, and remove the filter stator to take out the filter on the front door, as shown in Figure 6-1.

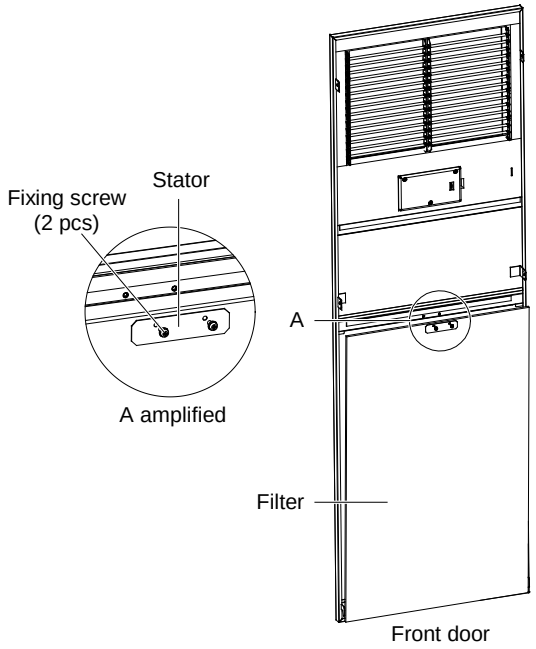


Figure 6-1 Taking out the filter on the front door

- Filter on the side panel

Unscrew (not remove) the fixing screws on the filter stator, move the stator along the guide rail, and then take out the filter on the side panel, as shown in Figure 6-2.

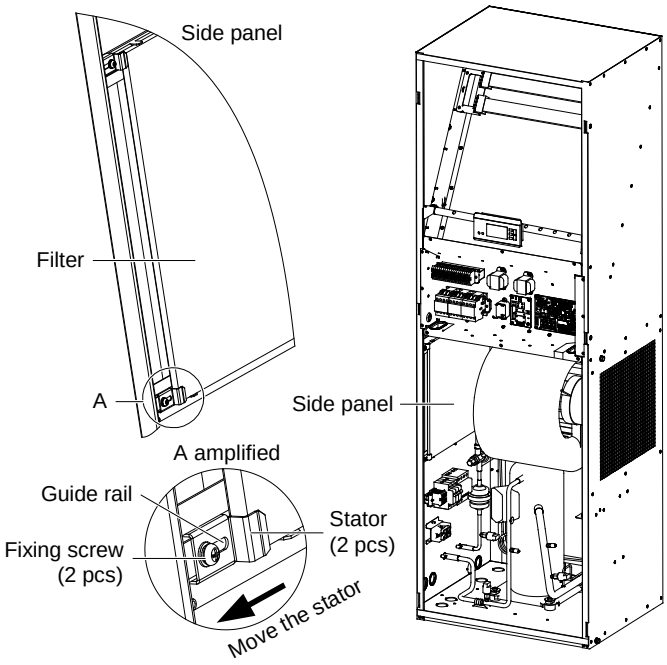


Figure 6-2 Taking out the filter on the side panel

6.2.2 Fan

The monthly inspection items of the fan kit includes: motor operation status, impeller status, fan kit fixation and clearance between fan and impeller.

Inspect the motor bearing and impeller monthly and replace it if any damaged impeller is found.

Check that the impeller is tightly mounted on the rotor of the motor and does not rub against its neighboring metal components during rotation.

Since the fan kit operates 24 hours every day continuously, any unusual airflow obstruction must be cleared in time to avoid the damage to the cooling system and other system components caused by reduced air volume.

6.2.3 Drain Pipe

Inspect water pan periodically for normal operation of the drain pipe. Ensure that no foreign matter or leakage exits in the drain pipe.

6.2.4 Heater

If the optional heater is used, it should be maintained periodically. Ensure that no dust or foreign matter collects on its surface, the heater is fixed reliably and the cable connection is reliable.

The heater elements will heat continuously in normal station. Inspect the heater every six months for its normal operation.

If the heater needs to be replaced, please contact the Emerson maintenance personnel.

Note

The heater cable must be leaded through the thimble socket, then connected to the heater.

6.2.5 Humidifier

The humidifier kit consists of a bracket (including water pressure components, such as inlet solenoid valve and outlet solenoid valve), humidifier canister, humidification control board CP2 (located in a metal box close to the humidifier, including a current transducer TAM), water in pipe, drain pipe and steam pipe, as shown in Figure 6-3.

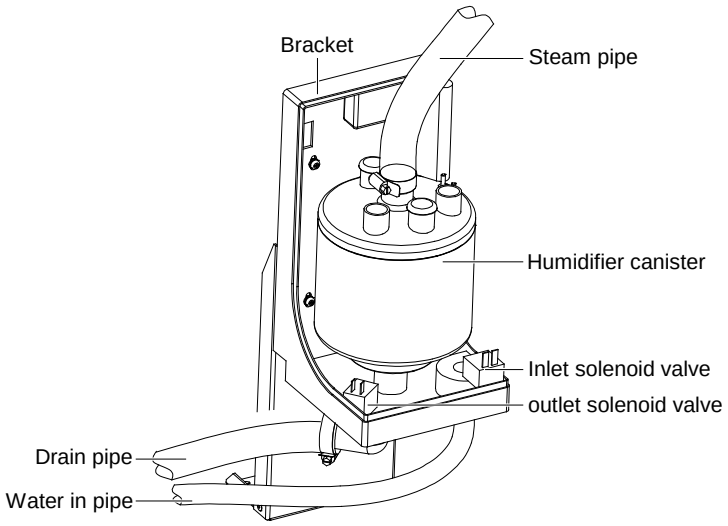


Figure 6-3 Humidifier

The micro-processing controller calculates whether the humidification is required according to the temperature and humidity values from the THS. If a call for humidification is registered, the micro-processing controller will send a humidification command to the humidification control board, through the spare humidification setting port and humidification output port located on the port board (see the connection diagram attached to the AC unit), and provide 24V power to it. Then the humidification control board will start the humidification operation. The humidification control board adopts ON/OFF operation mode, and it controls the humidification operation according to a programmed procedure. The humidification control board is located in a metal box close to the humidifier and its interfaces are shown in Figure 6-4.

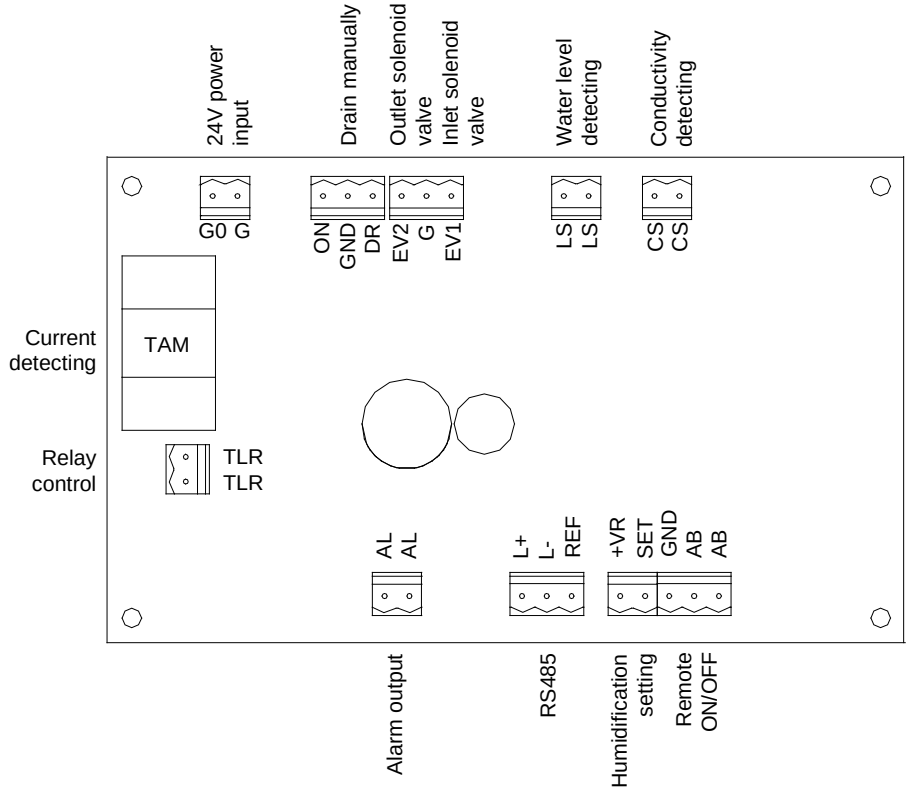


Figure 6-4 Interface of humidification control board

As a consumable, the humidifier does not need regular cleaning. Because the sediment exists in the water drained from the humidifier, the humidifier tray should be cleaned periodically to avoid clogging the tray and the draining pipe. The cleaning cycle varies with the water quality and humidification operation time. It is recommended to clean (when necessary) the humidifier tray once a month. The humidifier tray is shown in Figure 6-5.

Figure 6-5 Humidifier tray

If the water stays entering the humidifier or the input voltage of the humidification electrode is normal, but the water fails to boil. It indicates that the humidifier reaches its service life and needs to be replaced.

See the following procedures to replace the humidifier:

1. Turn off the humidifier by setting the humidity setpoint lower than the actual humidity in equipment room.
2. Place the RUN/DRAIN switch to DRAIN position to drain the humidifier.
3. Turn off the AC power.
4. Remove the connection cable of the humidification electrode and high water level probe from the canister.

Note

Canister and steam hose may be very hot! Allow time for the humidifier to cool before replacement.

5. Loosen the steam outlet hose clamps and remove the steam hose from the canister fitting.
6. Remove the canister from the humidifier bracket. Pay attention to protect the O-ring.

Reverse previous steps to re-assemble the humidifier, paying special attention to the following:

1. Protect the O-ring between the sealing canister bottom and the humidifier bracket.
2. Check and ensure that the steam outlet hose is connected without leakage.

3. Connect the power cable correctly.

4. Restore the humidity setpoint to the original setting.

6.2.6 Power SPD

Power SPD

The position of the power SPD is shown in Figure 6-6.

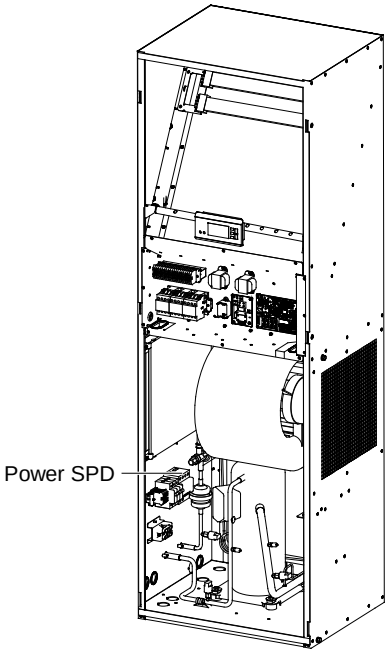


Figure 6-6 Power SPD position

The power SPD has four status indicators, as shown in Figure 6-7. The status indicators are green in normal operation; they become red upon failure.

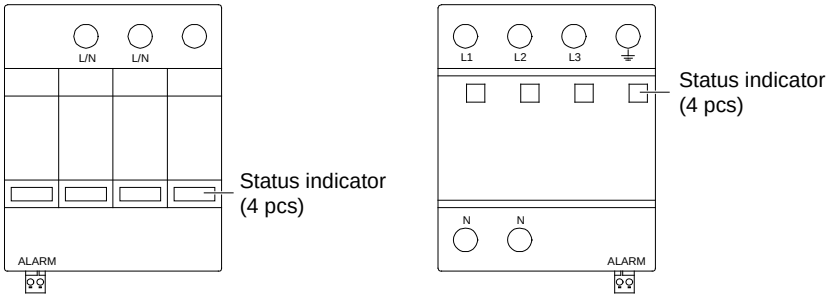


Figure 6-7 Status indicator position of power SPD

The power SPD does not need special maintenance. It needs regular check for non-loosening and normal status indicating.

If any one of the following phenomena appears, the power SPD has failed and it needs to be replaced immediately.

1. Any indicator of the power SPD turns red.

2. The customer alarm 1 is generated (see *SPD (Customer 1 terminal)* in *3.5.1 Connecting Control Terminals*).

6.2.7 Thermal Expansion Valve

The thermal expansion valve keeps the evaporator supplied with enough refrigerant to satisfy load conditions. Its proper operation can be determined by measuring the superheat level. The correct superheat setting is 5.6°C to 8.3°C (10°F to 15°F).

6.2.8 High-Pressure Switch And Low-Pressure Switch

The discharge pressure and suction pressure will vary greatly with the AC unit load and ambient conditions (refer to Table 6-1) during normal operation. When the discharge pressure rises to the high-pressure setpoint, the high-pressure switch will activate and the control system will shut down the compressor after ensuring an abnormal input signal of the high-pressure switch.

When the suction pressure is lower than the low-pressure setpoint, the low-pressure switch will activate and the control system will shut down the cooling system after confirming.

Table 6-1 Typical discharge pressure and suction pressure

Item	psig	MPa
Low pressure	57.5 ~ 99.8	0.397 ~ 0.67
Low-pressure setpoint	20	0.138
Low-pressure recovery point	36.3	0.25
High pressure	180 ~ 275	1.242 ~ 1.895
High-pressure setpoint	400	2.76
High-pressure recovery point	307	2.1

6.2.9 Compressor

The compressor fault is generally classified into two types:

1. Motor fault (such as winding burnout, insulation failure, short-circuit between coils and so on).

2. Mechanical fault (such as compressing failure, relief valve fault, therm-o-disc fault and so on).

If the operation pressure is not established, it indicates that the compressor has failed. It can be confirmed if the suction pressure and discharge pressure are balanced and the motor does not rotate reversely.

The controller has powerful alarm and protection functions to ensure safe operation of the compressor. The maintenance personnel should record the high pressure and low pressure and find out the cause of an alarm protection during periodical maintenance and inspection.

Note

Avoid touching or contacting the residual gas and oils in compressor with exposed skin. Wear long rubber gloves to handle contaminated parts.

Check the following items before replacing the compressor:

1. Check that all fuses and circuit breakers are normal.

2. Check the working status of the high and low pressure switches.

3. Check the relevant historical alarm information.

4. Check the historical operation records of the compressor.

5. Check the motor electric characteristic.

Note

System contains refrigerant. Reclaim the refrigerant using standard reclaiming equipment before maintenance.

Follow the following procedures to remove and replace the failed compressor:

1. Cut off the power.

2. Attach suction and discharge gauges to compressor access fittings.

3. Reclaim the residual refrigerant by using standard reclaiming procedures.

Note

Release of refrigerant to the atmosphere is harmful to the environment. Refrigerant must be recycled in accordance with state and local regulations.

4. Remove the failed compressor.

5. Follow manufacturer’s instructions to clean out kits.

6. Install replacement compressor and make all connections. Do pressurization and leakage tests to the system at approximately 150psig (1034kPa).

7. Evacuate the system twice to 1500 microns and the third time to 500 microns. Break the vacuum each time with clean and dry refrigerant to 2psig (13.8kPa).

8. Charge the system with refrigerant based on the requirements of the evaporator, condenser and refrigeration lines.

9. Apply power to and operate the AC unit. Check for proper operation. Refer to the circulation suction pressure and discharge pressure ranges in normal operation, and supplement some refrigerant if necessary.

6.3 Outdoor Unit Maintenance

6.3.1 Refrigeration System

The components of the refrigerant system should be inspected monthly for finding abnormal operation phenomenon in time. Refrigerant pipes must be properly fixed and not allowed to vibrate against wall, floor or the unit frame. Inspect all refrigerant pipes every six months for signs of wear.

6.3.2 Air-Cooled Condenser

When the airflow through the outdoor unit is restricted, use compressed air or fin cleaner (alkalescence) to clean the condenser off the dust and debris that inhibit airflow. The compressed air should be blown at the reversed airflow direction. In winter, do not let snow to accumulate around the side or underneath the condenser. Check for bent or damaged fins and simply repair them if necessary. Check all refrigerant pipes and capillaries for vibration and support them if necessary. Carefully inspect all refrigerant pipes for signs of oil leakage, determining the leakage position.

6.3.3 Low-Temperature Unit Of Lee-Temp Outdoor Unit

Periodically check the liquid level of the refrigerant in fluid reservoir to ensure that no refrigerant leakage happens. For detailed operation, refer to *4.2.5 Checking Refrigerant Charge Capacity Of Lee-Temp Outdoor Unit*.

Periodically check whether the heating belt of the fluid reservoir works normally. See following for details:

When the system is powered on and standby, and the fluid reservoir pressure is lower than 0.85Mpa, the heating belt preheats the fluid reservoir. If the heating does not happen, check whether the fuse of the heating belt is blown or if the pressure switch works normally. After confirming the fault part(s), replace it or them.

The heating belt fuse specifications are listed in Table 6-2.

Table 6-2 Fuse specifications

Manufacturer	Model	Voltage	Rated current
Bussmann	S500-1A	250V	1A
Littelfuse	0217001	250V	1A

6.4 Maintenance Inspection Checklist

Note

Regular inspections are necessary to ensure proper operation of the AC unit.

Table 6-3 Maintenance inspection checklist

Liebert_DM AC			
Date:		Prepared by:	
Model:		Serial Number:	
Type	Maintenance components	Item	Result
Monthly	Filter	Check for restricted airflow	
		Check the filter	
		Clean the filter	
	Humidifier (if applicable)	Check humidifier for mineral deposits	
		Check condition of electrodes	
		All hoses and fittings are tight	
	Indoor unit fan	Impellers free of debris and move freely	
		Bearings in good condition	
	Power SPD (if applicable)	Check for indicator color	
	Drain system (including condensate pump)	Check and clean out unit drain pipes, humidifier and tray, condensate pump and building drain pipes	
Semi-annually	Compressor	Signs of oil leaks	
		Vibration isolation	
	Refrigerant system	Suction pressure	
		Discharge pressure	
		Superheat	
		Evaporator in tight and clean condition	
		Charging capacity of refrigerant	
		Evident temperature difference between before and after the filter drier	
	Air-cooled condenser	Condenser coil is clean	
		Motor mounted tightly	
		Bearing in good condition	
		Refrigerant pipes properly supported	
	Electric board	Check electrical connections	
		Check the surface for signs of corrosion	
	Electric heater	Check for signs of corrosion	
	Humidifier	Check and clean the inlet solenoid valve	
		Check and clean the outlet solenoid valve	
		Replace the hose that has become rigid or fragile	
		Clean draining pipes completely	
	Low-Temp low-temperature unit	Check for the liquid level of the refrigerant in fluid reservoir and leak of the fluid reservoir fittings	
		Check whether the heating belt of the fluid reservoir works normally	
Notes:			
Signature:			

Make photocopies of this form for your records.

Chapter 7 Troubleshooting

This chapter expounds the troubleshooting of the Liebert_DM AC.

See Table 7-1 for the troubleshooting of the Liebert_DM AC.

Table 7-1 Troubleshooting

Fault phenomenon	Possible cause	Check or remedy
Unit does not start	No power to unit	Check unit input voltage
	Circuit breaker that controls voltage (at the transformer) is open	Locate short circuit and reset circuit breaker
	Float switch relay has closed due to high water level in the condensate pump sump	Check that drain pipes and pipelines are clogged or that the condensate pump is damaged
	Jumping cables not in place	Check jumping cables on the control board
No cooling	Compressor contactor not pulling in	Check for 24Vac ± 2Vac at the winding. If the voltage is right, check the contactor
	High compressor discharge pressure	See 'High pressure alarm' for checking and maintenance descriptions
	Plugged strainer	Clean or replace the strainer
	Low refrigerant charge	Use suction and discharge pressure gauge to check the pressure. View whether evident bubbles exits through the sight glass
High pressure alarm	Insufficient airflow across condenser	Remove debris from coil surface and air inlet; check the control board for the fan speed regulation performance
	Condenser fan not operating	Check that the cable connection from the control board to the terminal block of outdoor unit is tight; check that the outdoor unit connections are tight; check that the condensate pressure sensor works normally
Heater does not operate	Heat function disabled in Select Options menu	Set Heat to 'ON', refer to *Select Options* in *5.6.5 System Menu*
	No heat demand output from the control system	Adjust temperature setpoint and sensitivity within the required range
	Elements burned out	Turn off the power. Check the element resistance with a multimeter
Display abnormal	Static discharge	Disconnect the system power, and then restart
	Loose connection between display board and control board	Tighten the connection after powering off, and then restart
No display, control buttons do not respond and equipment operates normally	Disconnection between display board and control board	Check the connection between display board and control board
	Display board fault	Replace the display board
No display, control buttons do not respond and equipment has no output	Low power voltage	Check for power voltage
	Communication between control board and display board interrupted	Check the connection between control board and display board
Low pressure alarm	Refrigerant leakage	Check for leaking place and re-charge
	Outdoor ambient temperature too low	Contact local maintenance engineer
	Outdoor unit fan running at full speed upon low outdoor ambient temperature	Check that the cable connections of outdoor unit are normal; check that the condensate pressure sensor is normal
High temperature alarm	High temperature setpoint unreasonable	Reset the setpoint
	Room load exceeding unit design ability	Check for room seal or make capacity expansion
Low temperature alarm	Low temperature setpoint unreasonable	Reset the setpoint
	Heater operation current improper	Check for heater working operation
High humidity alarm	Setpoint unreasonable	Reset the setpoint
	Vapor barrier not done in the room	Check for the vapor barrier
Low humidity alarm	Setpoint unreasonable	Reset the setpoint

Appendix 1 Menu Structure

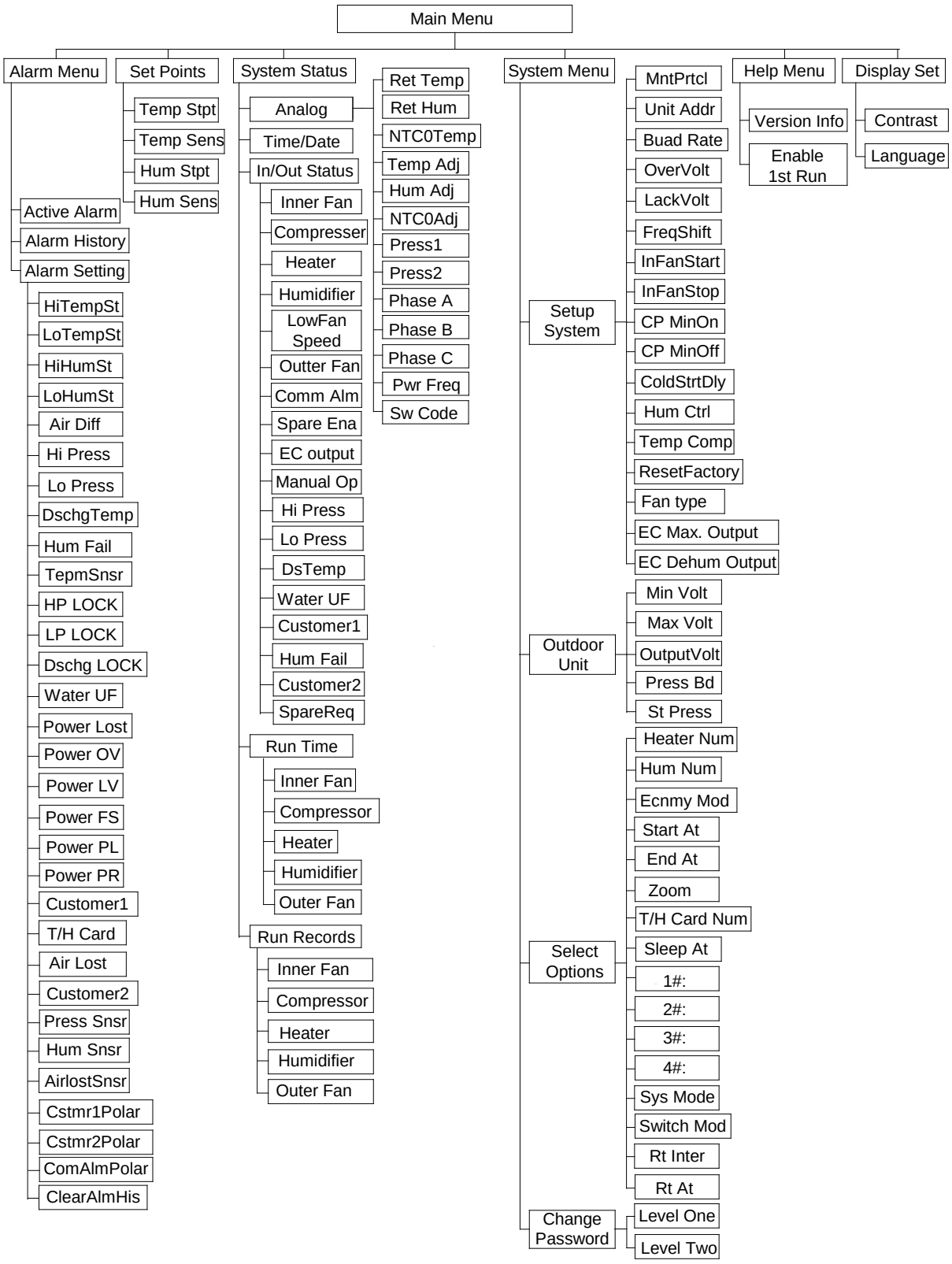


Figure 1 Menu structure

Appendix 2 Parameter Setting Table

Menu		Parameter	Default	Setting range
Alarm Menu	Alarm Setpoint	Hi Temp	35°C	25°C ~ 50°C
		Lo Temp	15°C	5°C ~ 20°C
		Hi Hum	65%RH	65%RH ~ 90%RH
		Lo Hum	35%RH	10%RH ~ 35%RH
		Air loss	25°C	30°C
		Alarm output (general alarm)	ENAB	OFF, ENAB, DISA
		Alarm output (serious alarm)	ENAB	DISA, ENAB
		Customer 1	NC (the unit equipped with SPD is NC by default)	NO, NC
		Customer 2 (remote shutdown)	NC	NO, NC
Set Points		TempStpt	24°C	15°C ~ 35°C
		TempSens	3°C	1°C ~ 5°C
		Hum Stpt	50%RH	20%RH ~ 80%RH
		Hum Sens	5%RH	1%RH ~ 10%RH
System Status	Analog	Temp Calib	0.0°C	-10°C ~ +10°C
		Hum Calib	0.0%	-10% ~ +10%
		NTC0 Calib	0.0°C	-10°C ~ +10°C
	In/Out Status	Manual Run Enab	NO	YES, NO
		In Fan Output	OFF	ON, OFF
		Comp Output	OFF	ON, OFF
		Heat Output	OFF	ON, OFF
		Hum Output	OFF	ON, OFF
		Low air Output	OFF	ON, OFF
		Out Fan Output	OFF	ON, OFF
System Menu	Setup System	Mntr Addr	1	1 ~ 254
		Mntr Prtcl	YDN23	YDN23, MODBUS
		Baut Rate	19200	1200 ~ 19200
		Over Press	15%	10% ~ 30%
		Under Press	15%	10% ~ 30%
		Pwr Freq Devia	3Hz	2Hz ~ 5Hz
		In Fan Start	10s	10s ~ 600s
		In Fan Stop	30s	10s ~ 300s
		Comp Run	180s	60s ~ 300s
		Comp Stop	180s	60s ~ 300s
		Cold St Delay	180s	30s ~ 240s
		Hum Control	RH	RH, AH
		Temp Compsen	OFF	ON, OFF
		Factory Reset	NO	YES, NO
		Fan type	AC	AC, EC
		EC max. output	74%	50% ~ 100%
		EC dehum output	60%	40% ~ 90%
	Outdoor Unit	Min. Volt	30%	30% ~ 50%
		Max. Volt	100%	60% ~ 100%
		Press BdWdth	5Bar	4Bar ~ 6Bar
		Start Press	13Bar	11Bar ~ 15Bar
	Select Options	Heat	0	0, 1
		Hum	0	0, 1 (set Heat Num to 1 before setting Hum Num to 1)
	Select Options_CostSave Mod_Economy Mod	Economy Mod	OFF	OFF, ON
		Start At	22:00	18:00 ~ 3:00
		End At	7:00	5:00 ~ 10:00
		Zoom	2°C	2°C ~ 10°C

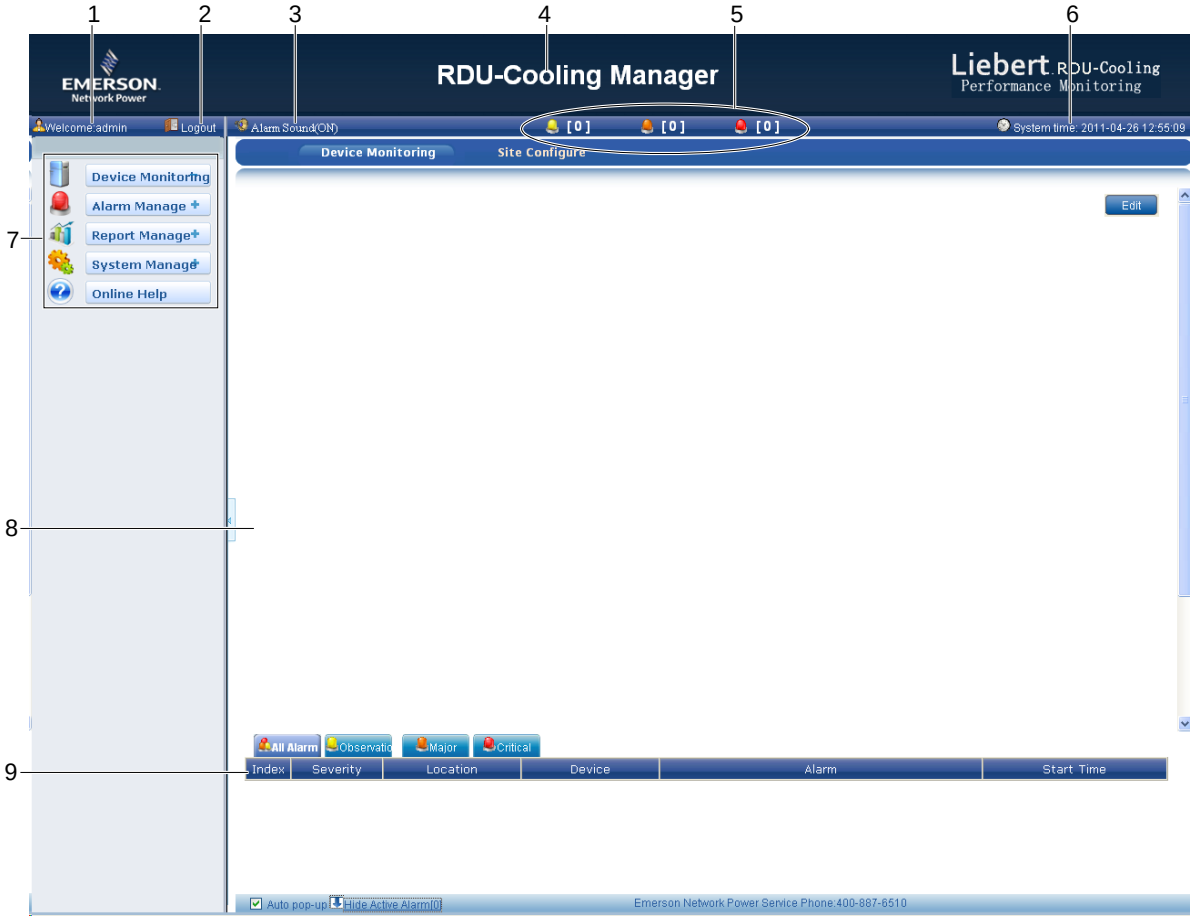
Menu		Parameter	Default	Setting range
System Menu	Select Options_CostSave Mod_Sleep Mod	EngySave Cd Num	0	0 ~ 4
		Sleep At	27°C	15°C ~ 40°C
	Select Options_Standby	Unit Status	SIG	SIG, HST, Standby
		Switch Mod	Standby	Standby, Rotate
		Rt Time	1d	1d ~ 7d
		Rt At	12:00	0:00 ~ 23:00
	Change Password	Level One	0001	0000 ~ 9999

Appendix 3 RDU-Cooling Air-Conditioner Single-Unit Manager Software Introduction

The RDU-Cooling manager is a monitoring system developed by Emerson Network Power Co., Ltd. (Emerson for short) to perform monitoring and management over the Liebert_DM air conditioner (Liebert_DM AC for short) designed by Emerson.

You can use the WEB browser to log in the RDU-Cooling manager to perform monitoring and management over the Liebert_DM AC.

After you have logged in the RDU-Cooling manager, the screen displays the primary interface, as shown in Figure 2.



1. Username *2. Logout button* *3. Alarm Sound (ON/OFF)* *4. System title* *5. Number of current alarms*
6. System time *7. Menu area* *8. Display & operation area* *9. Alarm display area*

Figure 2 Primary interface of the RDU-Cooling manager

The primary interface of the RDU-Cooling manager consists of three functional areas: menu area, display & operation area and alarm display area.

- The menu area displays five menus and all submenus, which can be selected by clicking.
- The display & operation area displays the operation interface of the selected menu, you can query or configure the information of this menu or perform relevant equipment control operations.
- The alarm display area displays all current alarms, click **Hide Active Alarm [alarm number]**, all current alarms will be hidden, and meanwhile, **Hide Active Alarm [alarm number]** will become **Show Active Alarm [alarm number]**. If **Auto pop-up** is ticked, when a new alarm generates, the alarm information will pop up automatically.

Click the **Logout** button to log out the current user and return to the login page.

Click **Alarm Sound (ON)** to turn on the alarm sound, and **Alarm Sound (ON)** turns to **Alarm Sound (OFF)**.

Functions of the RDU-Cooling manager include:

- Simple HMI (human-machine interface): The RDU-Cooling manager supports simple HMI function. You can change the site background picture and drag the site or equipment to change its icon location at will.
- Data query: Current equipment operating data, current alarm data, curve report and history data of the Liebert_DM AC can be queried.
- Alarm notification: The RDU-Cooling manager can send an e-mail and a short message to the user when an alarm occurs to the equipment.
- Remote control: The RDU-Cooling manager provides remote control function for the Liebert_DM AC.
- Remote adjustment: The RDU-Cooling manager provides remote adjustment function for the Liebert_DM AC.
- Report management: The RDU-Cooling manager provides alarm report, operating data report, operating data curve report and system log report of the Liebert_DM AC, and supports multiple pages display of the report and data export functions.
- User management: Users can be added, modified, deleted, and given different levels of software operation authorities according to their duties.

As shown in Figure 2, the menu area provides five menus, as described in Table 1.

Table 1 Menu description

Menu	Description
Device Monitoring	This menu allows you to add, change and delete device/site; configure alarm notificaition function; view current analog signal data, status signal data, and alarm information of the device; perform remote control and adjustment over the device
Alarm Manage	This menu allows you to query the real-time alarms and configure the alarm notification parameters
Report Manage	This menu allows you to query history alarm, history device data, cuive report and history system logs. It also provides print and print preview functions
System Manage	This menu includes User Manage and System Title. User Manage menu allows you to add, delete users, modify user information, and give them different levels of operation authorities according to their duties; System Title menu allows you to set the system title of the RDU-Cooling manager
Online Help	The Online Help menu provides an electronic file of the manual. Selecting this menu opens the electronic file of *RDU-Cooling Air-Conditioner Single-Unit Manager User Manual*

Note

1. The RDU-Cooling software CD is included in the unit accessory for free.

2. For detailed descriptions of RDU-Cooling, refer to *RDU-Cooling Air-Conditioner Single-Unit Manager User Manual*. This manual is installed together with the software on the computer, and you can find it through the **Online Help** menu.

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T: 603-78845000
F: 603-78845188

New Zealand
T: 64-3-3392060
F: 64-3-3392063

Pakistan
T: 92-42-36622526 to 28
F: 92-42-36622530

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T: 63-2-7207400
F: 63-2-6203693

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T: 65-64672211
F: 65-64670130

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